ANVIK RIVER SONAR
CHUM SALMON ESCAPEMENT STUDY, 2000

By

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ABSTRACT

The Anvik River sonar project has used side-looking sonar from mid June until the end of July of each year since 1979 to estimate the passage of summer chum salmon (*Oncorhynchus keta).* In 2000, an estimated 196,349 summer chum salmon passed the sonar site, failing to meet the lower range of the Anvik River Biological Escapement Goal of 400,000 to 800,000 chum salmon. The timing of the 2000 chum salmon run was late, with quartile passage dates 1 to 6 days later than the long term mean dates, based on 1979-1985 and 1987-1999 data. Eighty-nine percent of the combined sonar estimates occurred in the nearshore half of the sonar counting ranges in 2000. The predominant nearshore migration pattern of chum salmon, accuracy of sonar estimates, and species composition of passing fish were verified by periodic paired acoustic and visual tower counts. A consistent diurnal pattern of the chum salmon migration was observed in 2000. Chum salmon passed the sonar site at the highest hourly rates during the darkest hours of the day, with 30% of sonar estimates occurring in the 6-hr period between 22:00 and 04:00 hours. Based upon biological samples collected by beach seine, the sex ratio of chum salmon escapements was 60.8% females in 2000. The proportion of females increased as the run progressed. Combined age-4 and age-5 fish comprised 97.2% of the chum salmon in 2000. Age-4 fish were the dominant age class with 73.8% of the samples. The proportion of age-4 fish increased while the proportion of age-5 fish decreased over the course of the 2000 run.

INTRODUCTION

The purpose of the Anvik River sonar project is to monitor the escapement of summer chum salmon, (*Oncorhynchus keta)*, to the Anvik River drainage, which is thought to be the largest producer of chum salmon in the Yukon River drainage (Bergstrom et al. 1999). Additional major spawning populations of summer chum salmon occur in other tributaries of the Yukon River: the Andreafsky located at river kilometer (rkm) 167), Rodo (rkm 719), Nulato (rkm 777), Melozitna (rkm 938), and Tozitna Rivers (rkm 1,096). In tributaries to the Koyukuk River: (rkm 817) such as the Gisasa (rkm 907) and Hogatza (rkm 1,255) Rivers, and in tributaries to the Tanana River (rkm 1,118): Chena (rkm 1,480), and Salcha (rkm 1,553) Rivers (Figure 1). Chinook (*O. tshawytscha)* and pink salmon (*O. gorbuscha)* spawn in the Anvik River concurrently with summer chum salmon, whereas fall chum, a later run chum salmon, and coho salmon (*O. kisutch)* spawn in the Anvik River drainage later during the fall.

The timely and accurate reporting of information from the Anvik River sonar project is critical to Yukon River summer chum salmon management and to accurately assess the strength of the Anvik River run to meet the established Biological Escapement Goal range of 400,000 to 800,000 summer chum salmon. This information is also important in the assessment of the strength of the summer chum salmon run on the Yukon River upstream from the mouth of the Anvik River. This assessment is necessary to determine if summer chum salmon abundance is enough to meet upstream harvest and escapement needs. A side-looking sonar, capable of detecting migrating salmon along the banks of the streams, has been in place in the Anvik River since 1980.

The Electrodynamics Division of the Bendix Corporation developed the side-looking sonar[2] and conducted a pilot study using the side-looking sonar to estimate chum salmon escapement to the Anvik River in 1979. The results indicated that sonar-based estimation of chum salmon escapements to the Anvik River was superior to the counting tower method used at that time (Mauney and Buklis 1980).

Project results for escapement studies using sonar technology on the Anvik River from 1979 to 1995 have been reported by Mauney and Buklis (1980), Buklis (1981, 1982, 1983, 1984a, 1984b, 1985, 1986, 1987), Sandone (1989, 1990a, 1990b, 1993, 1994a, 1994b, 1995, 1996), Fair (1997), and Chapell (2001).

Background Information

Commercial and subsistence harvests of Anvik River chum salmon occur throughout the mainstem Yukon River from the coast of the delta to the mouth of the Anvik River, and within the first 19 rkm of the Anvik River. This section of the Yukon River includes Lower Yukon Area Districts 1, 2, and 3, and the lower portion of Subdistrict 4-A in the Upper Yukon Area (Figure 1). Most of the

[2]Use of a company's name does not constitute endorsement.

effort and harvest on this stock occurs in Districts 1 and 2, and in the lower portion of Subdistrict 4-A below the confluence of the Anvik and Yukon Rivers.

In the Lower Yukon Area, run timing of summer chum and chinook salmon overlap, with runs beginning at river-ice breakup through early July. During this time, commercial fisheries in the Lower Yukon Area have traditionally targeted chinook salmon, while Subdistrict 4-A commercial fisheries have targeted summer chum salmon. In the Lower Yukon Area, large-mesh gillnets (stretch mesh greater than 15.2 cm) were employed to harvest chinook salmon. Although these were very efficient for chinook salmon, the associated harvest of summer chum salmon through 1984 was small in relation to the size of the chum salmon run. Therefore, prior to the 1985 season, the Alaska Board of Fisheries (BOF), in order to allow directed harvests of summer chum salmon in the Lower Yukon, adopted regulations allowing fishing periods restricted to small-mesh (15.2 cm maximum stretch mesh) gillnets during the chinook salmon season provided that (1) the summer chum salmon run was of sufficient size to support additional exploitation, and (2) the incidental harvest of chinook salmon during these small-mesh fishing periods did not adversely affect conservation of that species.

Increased market demand prompted allocation disputes between fishers in different districts. In February 1990, the BOF established a guideline harvest range of 400,000 to 1,200,000 summer chum salmon for the entire Yukon River, allocated by district and subdistrict based on the average harvests of the previous 15 years (ADF&G 1990). Summer chum salmon escapement to the Anvik River exceeded the lower range of the Anvik River Biological Escapement Goal (Clark and Sandone 2001) of 400,000 salmon by an average of 233,000 salmon from 1979 to 1993.

In order to allow commercial exploitation of surplus chum salmon returning to the Anvik River, in March of 1994 the BOF adopted the Anvik River chum salmon fishery management plan, which permits a commercial harvest of summer chum salmon in the terminal Anvik River Management Area (ARMA) (ADF&G 1994). In 1996, the BOF established a harvest limit of 100,000 pounds of chum salmon roe for the ARMA (JTC 1996). A more complete history and background information can be found in the Annual Management Reports for the Yukon Area that are published each year by the Alaska Department of Fish and Game.

Objectives

The purpose of this project is to monitor the escapement of summer chum salmon to the Anvik River and to assess the age and sex composition of the escapement. The two primary objectives of this project are to:

1. Estimate the daily summer chum salmon escapement passing the Anvik River sonar site; and

2. Estimate the age and sex composition of the summer chum salmon spawning escapements.

METHODS

Study Area

The Anvik River originates at an elevation of 400 m and flows in a southerly direction approximately 200 km to its mouth at rkm 512 of the Yukon River (Figure 1). It is a narrow runoff stream with a substrate mainly of gravel and cobble. Bedrock is exposed in some of the upper reaches. The Yellow River (Figure 2) is a major tributary of the Anvik drainage and is located approximately 100 km upstream from the mouth of the Anvik River. Downstream from the confluence of the Yellow River, the Anvik River changes from a moderate gradient system to a low gradient system meandering through a much broader flood plain. Turbid waters from the Yellow River greatly reduce the water clarity of the Anvik River below their confluence. Numerous oxbows, old channel cutoffs, and sloughs are found throughout the lower Anvik River.

Anvik River salmon escapements were partially estimated from visual counts made at counting towers from 1972 to 1979 above the confluence of the Anvik and Yellow Rivers (Figure 2). A site 9 km above the Yellow River on the mainstem Anvik River was used from 1972 to 1975 (Lebida 1973; Trasky 1974, 1976; Mauney 1977). From 1976 to 1979 a site on the mainstem Anvik River near the confluence of Robinhood Creek and the Anvik River was used (Figure 2; Mauney 1979, 1980; Mauney and Geiger 1977). Other than 1974, aerial surveys have been conducted in each year since 1961 in fixed-wing aircraft to estimate salmon abundance below the tower site. Since 1979, the Anvik River sonar project has been located approximately 76 km upstream of the confluence of the Anvik and Yukon Rivers, 5 km below Theodore Creek (Figure 2) in Section 35, Township 31 North, Range 61 West, Seward Meridian. The land is public, managed by BLM, and presently unclassified. Aerial survey data indicate chum salmon spawn primarily upstream of the sonar site.

Sonar Deployment and Operation

The sonar system operates by transmitting sound waves outward along the riverbed, from transducers located near the shore. Echoes from targets passing through the sonar beam are reflected back to the transducer and filtered and processed in the transceiver. Echoes which satisfy the criteria for strength and frequency are considered valid and are counted as fish. Echo selection criteria, are designed to estimate fish passage and minimize debris counts. Echoes are counted and combined to estimate fish abundance. For the Anvik River sonar salmon counting project, all fish targets are considered salmon. Paired visual counts confirm that the nearly all fish observed are salmon.

During the 2000 season, 1981-model sonar "counters" (transceivers) were deployed and operated according to guidelines described by Bendix Corporation (1981) on each bank of the Anvik River to estimate chum salmon passage (Figure 2). The transducers were deployed and operated without the prescribed artificial aluminum substrate throughout the season. This practice of operating without an artificial substrate was first employed on the Anvik River in 1986 (Buklis

1986). The right (west) and left (east) bank sites used in previous years were probed to locate uniform river bottom gradients that would provide optimum linear surfaces for ensonification. Each sonar transducer was mounted to a pipe configuration, which allowed the transducer to be moved during aiming without affecting stability. Sandbags were placed on top of the pipe base to ensure stability. Transducers were aimed perpendicular to the current and were offset to prevent interference (cross-talk) between opposite banks (Figure 3). To prevent fish passage inshore of the transducer, fish leads constructed of T-stakes and rectangular mesh fencing were installed downstream of the transducer. Extending from shore to approximately 1 m beyond the transducer, the fish leads were at an oblique angle from shore leading upstream. On the right bank, a counting tower of aluminum scaffolding material approximately 3 m in height was placed between the bank and the transducer in the river upstream of the fish lead for visual observation of salmon when water conditions permitted. An identical tower on the left bank was placed on the shore downstream of the fish lead. Transducers, leads, and counting towers were moved inshore or offshore as required by fluctuating water levels.

Transducers were aimed, and ranges adjusted, so that echoes resulting from the stream bottom or surface interface did not register as 'counts' by the sonar electronics. Sensitivity, as measured in voltage from peak to peak, was adjusted to the highest level without registering false 'counts'. This level was usually the maximum possible for the equipment. Sonar ensonification ranges were adjusted in response to changing river conditions. The 1981-model counter has a maximum range of 30 m. Because of the conical shape of the sonar beam, its width and height increase with distance from the transducer. The ensonified zone of the river encompassed approximately the bottom one-half of the vertical water column within the counting range throughout operations.

The counters used on the Anvik River sonar project divided each of the ensonified ranges into 16 sectors of equal length. Sector length was dependent on each transducer's total range of ensonification and was therefore 1/16 of the total range. In subsequent analyses of data, the range is divided into the 16 sectors with the numbers originating at the transducer face and continuing offshore toward the thalweg.

As in previous years, the sonar was initially installed approximately 100 m upstream from the field campsite. The right bank transducer was situated on a gradually sloping gravel bar on the inside of a slight bend in the river. The left bank transducer was located on the outside of the bend where the water level increased at a more rapid rate and the current was faster than the inside of the bend. When the water level dropped one week after the initial set-up, a large gravel deposit (a small bar) became apparent on the east side of the thalweg, between the left and right bank transducers. Because of this change in river bottom topography, the sonar equipment was relocated to a second, more suitable site approximately 200 m upstream from the first site. Both transducers were placed in water approximately 0.7 m deep.

Historical run timing was used to plan the Anvik River sonar project start dates. In most years, some salmon pass the sonar site prior to and after the cessation of sonar operations. However, these numbers probably comprise only a small fraction of the total run. The criteria for terminating sonar sampling were daily chum salmon passage estimates of one percent or less of the season's total passage estimate for three out of four days.

Sonar Calibration and Sampling

Each sonar transceiver was calibrated at least four times daily by observing passing fish targets using an oscilloscope. In this and past studies using the Bendix system, the term calibrate refers to adjusting the pulse rate (also known as ping rate) of the transducer to account for variable fish swimming speeds. Fish passing through the sonar beam produce a distinctive oscilloscope trace that resembles a tall, momentarily suspended spike. During each calibration period, the number of fish detected by an operator using an oscilloscope was compared to estimates automatically recorded by the sonar electronics. The fish velocity control setting, which controls the sonar counter's ping rate, was adjusted immediately after a calibration if the sonar: oscilloscope estimate ratio varied from 1.0 by 15% or more. If the ratio was greater than 1.15 or less than 0.85 the existing fish velocity setting was multiplied by the calculated ratio to obtain a new fish velocity control setting. If adjustments were made to the sonar unit, the change was documented in the calibration log, and an additional calibration was made to ensure that the new sonar:oscilloscope estimate ratio was within the accepted limits and to initialize the counting period. Each initial calibration lasted for at least 15 minutes or until the observer estimated 100 fish had passed, whichever came first.

During daytime, sonar calibration periods operators also attempted to visually count passing fish from the counting towers to train personnel in oscilloscope monitoring and to estimate the daily proportion of pink salmon because sonar counters do not distinguish between species of fish. This daily proportion of pink salmon was applied to the adjusted daily fish passage estimate to yield a daily estimate of pink salmon passage. This estimate was subtracted from total salmon passage to yield the daily chum salmon passage estimate. Observers wore polarized sunglasses to reduce water surface glare. Glare, low light, wind ripples, rain, and turbid water conditions sometimes hampered tower observations of fish. Aerial and carcass surveys were used to obtain a separate estimate for chinook salmon abundance. These estimates were not subtracted from the sonar fish estimate because chinook salmon abundance is low relative to the other salmon runs in the Anvik River.

Four daily calibration times were deemed adequate to monitor the diurnal-timing pattern of the salmon migration (Sandone 1996). Calibrations were normally conducted during 0600, 1200, 1800, and 2400 hours. Occasionally, calibration times deviated from prescribed times. Counting periods were defined by each calibration event. An adjustment factor, specific to each counting period and to each bank was calculated using the following formula:

$$A_{b,n} = \frac{OC_{b,n}}{SC_{b,n}}$$

Where A = periodic adjustment factor,
b = right or left bank,
n = counting period (0000-0600, 0600-1200, 1200-1800, or 1800-2400),
OC = oscilloscope counts, and
SC = sonar counts.

For each bank, adjusted passage estimates were calculated by multiplying each calibration period's adjustment factor by the unadjusted sonar estimates for each hour within the calibration period. Adjusted estimates were further corrected for missing data and corrected hourly estimates were entered into a spreadsheet program on a desktop computer. The resulting corrected sonar estimates for each hour within a day were summed, yielding the estimated fish passage for that day for that bank. The daily passage of fish for the whole river was determined by summing the daily bank-specific estimates. Daily adjustment or correction factors for each bank and for both banks combined were calculated by dividing the daily-corrected estimates by the raw sonar estimates. Raw sector estimates for each day were corrected using the overall daily correction factor. Corrected hourly and sector estimates were used to describe the temporal and spatial distribution of the run.

If hourly sector estimates were lacking because of debris, printer malfunction, or weather-related disruptions of sonar operations, passage estimates were calculated by averaging sector estimates for the hour before and after the missing data. When hourly data were not recorded for three to 12 hours within one day, the daily estimate was calculated by dividing the corrected partial daily value by the mean proportion of corrected estimates of the corresponding hours for the first day before and after the day in question with complete data collection. When conditions forced a suspension of sonar sampling on only one bank for 12 hours or more, that bank's daily estimates were calculated from fish passage on the opposite bank in conjunction with a bank-specific passage proportion based on all days during the season with full counts from both banks. When sampling was suspended on both banks for an entire day, the daily total fish passage estimate was made using straight-line interpolation between the previous day's, and the following day's whole river corrected estimates. To recreate the spatial and temporal distribution of estimates made for time periods with no recorded data for more than two hours, the seasonal total fish estimate for each hour and sector of each bank was divided by the season adjusted total for that bank. The resulting proportions (one for every hour and sector) were multiplied by the interpolated daily estimate, resulting in an interpolated estimate of the spatial and temporal fish passage.

Age-Sex-Length Sampling

Temporal strata, used to characterize the age and sex composition of the chum salmon escapement, were defined as quartiles using the dates on which 25%, 50%, 75%, and 100% of the total run had passed the sonar site. These quartile-sampling strata were determined preseason based on historical run timing data; they represent an attempt to sample the escapement for age-sex-length (ASL) information in relative proportion to the total run. In 2000, these strata were defined preseason as: 17-30 June; 1-7 July; 8-14 July; and 15-30 July based on the run timing in 1998 and 1999. Because no chum salmon were sampled within the first stratum the dates were adjusted during the 2000 season to reflect the actual chum salmon run timing to three sampling strata: 30 June-7 July; 10-15 July; and 19-24 July.

To meet region-wide standards for the sample size needed to describe a salmon population, the initial seasonal ASL sample goal was 608 chum salmon, with a minimum of 162 chum salmon

species of fish, fish estimate information presented in this report combines chum and pink salmon. Information that is exclusively chum salmon data is titled as such.

The daily pink salmon ratio is interpolated from the total daily estimate based on the daily visual observations that the crew performed. This method of extrapolation assumes that pink salmon have similar temporal and spatial behavior patterns as chum salmon. In the same manner as the chum salmon, an average of 17% of the daily pink total passed on the left bank while 83% of the daily pink salmon passed on the right bank. Based on the overall run data in 2000, it is clear that pink salmon do not have exactly the same behavior as summer chum salmon. The pink salmon run was later than the summer chum salmon run. The pink salmon peak passage day was four days later than that of the chum salmon and the pink salmon had a second surge 22-24 July while the chum salmon run was declining (Figure 6). Since visual observations could not be made at night or far offshore, the assumption that pink salmon have the same behavior patterns as chum salmon was not tested at the Anvik site.

Buklis (1982) expanded the season escapement estimates for 1972 through 1978, making it possible to compare earlier visual estimates to more recent annual sonar estimates (Appendix Table A.). The 2000 chum salmon escapement estimate of 196,349 was 73% below the mean Anvik River escapement estimate of 735,433 fish, based on 1972-1999 data. The 2000 escapement failed to meet the lower range of the recently adopted Biological Escapement Goal (BEG) of 400,000 to 800,000 summer chum salmon, achieving only 49% of the lower range. Detailed passage estimate and proportions for each hour and each sector for the season can be found in Appendix Table B.

Spatial and Temporal Distribution

Buklis (1982) first reported a distinct diurnal salmon migration pattern during the 1981 season with a higher proportion of the migration passing the sonar site during the darker hours of the day. Similar diurnal patterns were reported from 1985 through 1999 (Buklis 1985, 1986, 1987; Sandone 1989, 1990a, 1990b, 1993, 1994a, 1994b, 1995, 1996; Fair 1997; Chapell 2001). This trend is supported by the 2000 Anvik River data as well (Table 6, Figure 7). The temporal distribution of sonar estimates indicates a distinct diurnal pattern. Between the six hours of 2200 and 0400, 30% of the estimates were recorded (Table 6).

Prior to 2000, in all but three years that sonar was used to estimate Anvik River chum salmon escapement, most of the escapement passage had been associated with the right bank (Mauney and Buklis 1980; Buklis 1981, 1982, 1983, 1984a, 1984b, 1985, 1986, 1987; Sandone 1989, 1990a, 1990b, 1993, 1994, 1994b, 1995, 1996; Fair 1997; Chapell 2001). In the three exceptional years 1992, 1996, and 1997, only 43%, 45%, and 39%, respectively, of the total adjusted estimates were observed on the right bank (Sandone 1994a; Fair 1997; Chapell 2001). The shift to left bank was attributed to low water conditions that affected chum salmon migration patterns at the sonar site. The 1985-1999 average of chum salmon estimates passing along the right bank was 61%. The 2000 chum salmon migrations followed the dominant right bank orientation trend with 85.9% of estimated chum salmon passing on the right bank (Table 7 and Figure 8).

A fundamental assumption of the Anvik River Sonar project is that, because of the bank-oriented migration behavior of chum salmon, the two sonar systems based on opposite shores detect essentially all chum salmon passing the sonar site. In 2000, this assumption was supported by the lower relative passage estimates in the offshore sonar sectors (Table 7, Figure 7). During the 2000 season, the sonar sectors in the near-shore half of the combined left and right bank counting ranges accounted for 89.1% of the annual sonar estimates (Table 7, Figure 8). The near shore sectors on the left bank accounted for 70% of the passage, where the right bank near shore accounted for 92% of the passage. This relatively low nearshore passage on the left bank in 2000 can be explained by the shorter counting range on the left bank, which is the "cut" bank. In 2000, the crew had to relocate the sonar to a site up river to avoid a gravel bar that had developed during the spring flood of 2000 (Figure 3). The new location, and therefore a different bottom profile, may have also caused different fish passage behaviors at the location of the sonar.

During the 2000 season, minor day-to-day changes of fish passage proportions between sector estimates were probably caused by changes in placement and aiming of the transducer in response to fluctuating water levels, rather than by changes caused by fish migratory patterns.

Age and Sex Composition

In 2000, beach seine sets were made on 19 individual days from 20 June to 24 July (Table 8). A total of 498 chum salmon were captured, of which 478 were sampled for ASL information. Of the total sampled salmon, a total of 334 scale samples were in adequate condition to age (Table 9). Because of the late run timing of chum salmon in 2000, no salmon were captured before 1 July. Consequently, the captured salmon were grouped into three passage strata for the 2000 season, unlike the previous standard of four strata. For the sake of discussion in this report, these strata are discussed as Strata 2, 3 and 4. Sample sizes for the first through third passage strata were 163, 162, and 153 chum salmon, consecutively. Of those fish sampled for ASL data in each stratum, 115, 91, and 128 had ageable scales. Of the 478 chum salmon sampled for ASL data, 334 (70%) scales were aged, significantly less than the 85% expected rate.

The three strata that had samples during the 2000 season were dominated by age-4 chum salmon, accounting for 60.9%, 76.9%, and 84.4% of the passage (Figure 9 and Appendix C). Though the proportions of age-5 chum salmon were substantially lower than those of age-4 chum salmon, they were still significantly higher than the proportions of age-3 and age-6 salmon. The overall age composition of the escapement, using temporal strata determined by the closest sample dates and weighted by escapement estimates, was 0.9% age-3, 73.8% age-4, 23.4% age-5, and 1.9% age-6. Therefore, age-4 and age-5 chum salmon comprise 97.2% of the entire run. In comparison to historical mean values from 1972-1999, the age-4 proportion of the 2000 run was 16% higher and the age-5 proportion was 15% lower.

The age and sex composition of the Anvik River chum salmon escapement passing the sonar site has varied through the duration of the run. The trend usually is an increasing proportion of younger and female salmon as the run progresses (Fair 1997). This trend was also observed in the 2000 run (Figure 9). Using temporal strata determined by the closest beach seine sample dates and weighted

by escapement estimates, females comprised 53.0% of the second stratum, followed by an increase to 58.2% and 75.0% in the third and fourth strata, consecutively. Of the entire chum salmon run estimate for 2000, 60.8% were females.

The overall sex composition of the 2000 chum salmon escapements follows the historical trend of beginning with nearly equal proportions of male and female fish and progressing through the season with an increasing proportion of female salmon. Since 1979, females have dominated the escapement in 20 of the 22 years (Figure 10). The exceptions were 1995 and 1996. These two years also experienced two of the highest escapements in the history of the project (Table 3). Females have dominated the sex composition of age-4 Anvik River chum salmon in all years with the exception for 1995. The ratio of age-4 females:males averaged 1.6 in 1979-1999. The 2000 age-4 female to male ratio was identical to the historical average. Age-5 female and male chum salmon have been more closely matched in numbers, with a 1979-1999 female to male ratio of 1 to 1. However, this was not the case in 2000 with an age-5 female to male ratio of 1.8. Chum salmon were also sampled for length with the results reported in Table 9.

Hydrologic and Climatological Conditions

A river bottom profile measured the Anvik River width at 84 m on 24 June 2000 at site 1. A second profile measured the river's width at 66 m on 28 June 2000 at site 2. For the 2000 season, the average right bank sonar counting range was 20 m, and the average left bank counting range was 12 m. The right bank fish lead was 3 m to 12 m long depending on the water level and conditions. The left bank fish lead was approximately 22 m at site 1, and at site 2 was 5 m in length. Therefore the total river width covered by the fish lead and sonar equipment ranged from 40 m to 66 m throughout the 2000 season.

Beginning 21 June, the Anvik River water level dropped steadily until 14 July when heavy rain caused a flood event (Table 10, Figure 11). The drop in water level had been 75.0 cm until the resulting flood caused a rapid 47.0 cm rise in water level, followed by another slow and steady drop of 43.0 cm. The 2000 season experienced a wide range of temperatures. The maximum daily water temperature was 17.0°C and the minimum daily water temperature 10.0°C. The maximum daily air temperature was 29.0°C and the minimum daily air temperature was 0.0°C (Table 10, Figure 11). With the exception of two days, the daily maximum and minimum air temperatures always bound the daily water temperature.

Revised Results for 1997-1999

A review of the 1997 to 1999 data found errors in the data entry methodology into spreadsheets. These errors were corrected and the estimated summer chum salmon escapements changed slightly for all three years. Corrected daily and cumulative estimated passage can be found in Appendix Table A. The 1997 and 1999 escapement estimates changed very little but a significant change occurred in the 1998 escapement estimate. The total estimated escapement past the sonar site for 1997 changed from 609,118 to 605,752, a decrease of 3,366 summer chum salmon. The

total estimated escapement past the sonar site for 1998 changed from 469,547 to 487,301 an increase of 17,754 summer chum salmon. The total estimated escapement past the sonar site for 1999 changed from 441,305 to 437,356, a decrease of 3,949 summer chum salmon.

DISCUSSION

The 2000 summer chum salmon run continued to exhibit the decline in productivity observed in recent years. Summer chum salmon abundance has been below average to poor since 1997, although parent-year escapements for these runs (1994-1996) were very good. An estimated fifty-year flood event in the Koyukuk River drainage in August 1994 and low snow cover during the winter of 1995-96 may account for some of the decline in chum salmon abundance. However, changing climate and ocean conditions also appear to have impacted salmon survival.

In 2000, the Yukon River and Anvik River sonar projects provided early indications that the Yukon River summer chum salmon run was very weak and late (JTC 2000). There were no commercial openings in the Yukon Area for summer chum salmon, though there were three large mesh gear commercial openings for chinook salmon. During the Lower Yukon chinook salmon-directed commercial fishery, a preliminary estimate of the incidental harvest of summer chum salmon was 6,624 fish. In Subdistrict 4-A and the Anvik River Management Area there were no commercial openings for either salmon species. Estimates of the 2000 subsistence harvest was 82,224 and test fish harvests of summer chum salmon were 648. The estimated total harvest of summer chum salmon for the Yukon River was 89,500, 84% below the recent 10 year average (1990-1999) average of 349,500.

The 2000 Anvik River chum salmon escapement was 73% below the 1979-1999 average escapement of 735,433 and 51% lower than the lower range of the Biological Escapement Goal of 400,000 summer chum salmon. The Anvik River 2000 summer chum salmon escapement was the lowest on record since escapement estimates began in 1979. The reconstructed run size estimate of 434,078 (excluding Andreafsky River), based on Yukon River sonar passage estimates, estimated harvest, and escapement at the Pilot Station sonar project is the lowest on record and 73% below the average of 1,695,549.

The 2000 Yukon River and Anvik River sonar projects' assessments of summer chum salmon runs agreed with the below average escapement estimates in the Andreafsky, Nulato, Gisasa, and Chena Rivers, and the Clear, Caribou, Henshaw, and Kaltag Creeks (JTC 2000).

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Table 6. Anvik River summer chum salmon estimated passage and proportions by hour and bank, 2000.

Hour	Right Bank		Left Bank		Proportion of the Run		
Ending	Count	Cum.	Count	Cum.	Left Bank	Right Bank	Total
0100	9,389	9,389	1,438	1,438	0.007	0.048	0.055
0200	8,515	17,904	1,353	2,791	0.007	0.043	0.050
0300	7,972	25,876	1,751	4,541	0.009	0.041	0.050
0400	6,586	32,462	1,565	6,107	0.008	0.034	0.042
0500	6,209	38,671	1,152	7,259	0.006	0.032	0.037
0600	6,482	45,153	963	8,222	0.005	0.033	0.038
0700	6,352	51,505	973	9,194	0.005	0.032	0.037
0800	5,830	57,336	871	10,066	0.004	0.030	0.034
0900	5,467	62,803	863	10,928	0.004	0.028	0.032
1000	5,734	68,537	925	11,853	0.005	0.029	0.034
1100	6,300	74,837	970	12,823	0.005	0.032	0.037
1200	6,412	81,249	965	13,788	0.005	0.033	0.038
1300	6,690	87,939	935	14,723	0.005	0.034	0.039
1400	6,880	94,819	954	15,677	0.005	0.035	0.040
1500	6,814	101,633	902	16,580	0.005	0.035	0.039
1600	7,098	108,732	821	17,400	0.004	0.036	0.040
1700	6,963	115,695	1,061	18,462	0.005	0.035	0.041
1800	7,619	123,314	917	19,379	0.005	0.039	0.043
1900	6,612	129,926	1,093	20,472	0.006	0.034	0.039
2000	7,036	136,962	1,217	21,689	0.006	0.036	0.042
2100	7,416	144,379	1,257	22,945	0.006	0.038	0.044
2200	7,399	151,778	1,348	24,294	0.007	0.038	0.045
2300	7,869	159,646	1,751	26,044	0.009	0.040	0.049
2400	8,983	168,630	1,675	27,719	0.009	0.046	0.054

Table 7. Anvik River summer chum salmon estimated counts and proportions by sector and bank, 2000.

	Right Bank		Leftt Bank		Proportion of the Run		
Sector [a]	Count	Cum.	Count	Cum.	Left Bank	Right Bank	Cum.
1	15,127	15,127	826	826	0.077	0.004	0.081
2	44,194	59,321	4,015	4,841	0.225	0.020	0.327
3	47,898	107,219	4,883	9,725	0.244	0.025	0.596
4	24,364	131,583	3,222	12,946	0.124	0.016	0.736
5	11,804	143,387	1,780	14,727	0.060	0.009	0.805
6	6,483	149,870	1,571	16,298	0.033	0.008	0.846
7	3,817	153,687	1,631	17,929	0.019	0.008	0.874
8	1,908	155,596	1,423	19,352	0.010	0.007	0.891
9	2,207	157,802	1,148	20,499	0.011	0.006	0.908
10	3,032	160,834	1,104	21,603	0.015	0.006	0.929
11	4,104	164,939	684	22,287	0.021	0.003	0.954
12	1,143	166,082	813	23,100	0.006	0.004	0.963
13	743	166,825	1,093	24,193	0.004	0.006	0.973
14	946	167,771	905	25,097	0.005	0.005	0.982
15	452	168,223	1,005	26,102	0.002	0.005	0.990
16	407	168,630	1,617	27,719	0.002	0.008	1.000
Total	168,630		27,719		0.859	0.141	

[a] Sector counts begin at the transducer.

Table 8. Anvik River beach seine catches by species, sex, day, and stratum, and the number of chum salmon sampled for age, sex, and length information, 2000.

	Chum Salmon									Other Fish					
	Number Captured			Number Sampled			Number Aged			Salmon					
Date	Male	Female	Total	Male	Female	Total	Male	Female	Total	Pink	Chinook	Grayling	Whitefish	Dolly Varden	Other
20-Jun	0	0	0	0	0	0						3			
23-Jun	0	0	0	0	0	0						1		1	
25-Jun	0	0	0	0	0	0								1	
28-Jun	0	0	0	0	0	0						1	1	1	1 Sucker
1-Jul	2	3	5	2	3	5						4	3	1	
2-Jul	5	6	11	5	6	11					1	10		1	
3-Jul	10	9	19	10	9	19									
Subtotal (Strata 1)	17	18	35	17	18	35				0	1	19	4	5	
4-Jul	2	5	7	2	5	7						3	5		
5-Jul	5	14	19	5	14	19						3	9	1	
7-Jul	24	17	41	23	16	39						5	7		1 Northern Pike
8-Jul	32	33	65	32	31	63					1	1	5		3 Northern Pike
Subtotal (Strata 2) [a]	63	69	132	0 62	66	128	54	61	115	0	1	12	26	1	
10-Jul	16	18	34	16	15	31				6		8	10		
12-Jul	45	64	109	40	60	100				9	1	5	8		1 Sucker
15-Jul	14	17	31	14	17	31				10	2	3			1 Sucker
Subtotal (Strata 3)	75	99	174	70	92	162	38	53	91	25	3	16	18	0	
19-Jul	8	20	28	8	18	26				5	1	1	2		1 Sucker; 1 Burbot
20-Jul	5	6	11	5	6	11				11	2		6		1 Sucker
22-Jul	10	30	40	9	29	38				5	1	3	5		
23-Jul	10	26	36	10	26	36				6	3	3	9		1 Sucker
24-Jul	5	37	42	5	37	42				13	8				
Subtotal (Strata 4)	38	119	157	37	116	153	32	96	128	40	15	7	22	0	
Season Total	193	305	498	186	292	478	124	210	334	65	20	54	70	6	

[a] Includes the number aged from Strata 1.

Table 9. Anvik River summer chum salmon escapement age and sex composition, and mean length (mm), 2000. [a]

		Brood Year and Age Group				
		1997	1996	1995	1994	
		0.2	0.3	0.4	0.5	Total
Sample Size:	334					
Female	No. in Escapement	765	87,123	29,288	2,246	119,421
	Percent of Sample	0.4	44.4	14.9	1.1	60.8
	Mean Length	525.0	536.0	549.0	579.0	
	Std. Error	30.0	2.0	4.0	3.0	
Male	No. in Escapement	956	57,871	16,619	1,481	76,928
	Percent of Sample	0.5	29.5	8.5	0.8	39.2
	Mean Length	560.0	561.0	590.0	573.0	
	Std. Error	0.0	3.0	7.0	0.0	
Total	No. in Escapement	1,721	144,994	45,907	3,728	196,349
	Percent of Sample	0.9	73.8	23.4	1.9	100.0

[a] No samples were collected for the stratum 1 (6/15-7/03) due to late run timing and high water.

Table 10. Anvik River climatological and hydrological observaitions at the sonar site, 2000.

Date	Precipitation	Wind Direction	Velocity	Sky Code	Temperature (C) Air Min.	Air Max.	Water Temp.	Water Height Actual (cm)	Relative (cm)	Water Color	Comments
21-Jun	O	Variable	1	2	3.0	22.0	11.0	103	0	DK	
22-Jun	O	Variable	2	1	5.0	29.0	11.5	93	-10	DK	Hot and sunny.
23-Jun	O	Variable	1	2	6.0	29.0	14.0	84	-9	DK	Hot and sunny.
24-Jun	O	Variable	1	2	8.0	28.0	14.5	76	-8	DK	Hot and sunny.
25-Jun	O	Variable	2	1	9.0	23.0	16.0	70	-7	LT	Hot and sunny.
26-Jun	O	Variable	1	3	8.5	23.0	14.0	64	-6	LT	High clouds in evening.
27-Jun	O	West	1	3	9.0	20.0	14.5	59	-5	LT	High clouds in evening.
28-Jun	O	Variable	1	4	9.0	18.0	12.0	55	-5	LT	Cool, cloudy day.
29-Jun	O	O		4	9.0	15.0	12.0	51	-4	LT	Cool, cloudy day.
30-Jun	O	O		4	8.0	19.5	13.0	49	-2	LT	Cloudy day, clear evening.
1-Jul	O	Variable	1	2	6.0	23.5	11.0	45	-4	LT	Sunny.
2-Jul	O	O		2	8.0	23.5	12.0	45	0	LT	Sunny morning, cloudy evening.
3-Jul	I	Variable	1	3	8.0	22.0	14.0	41	-4	LT	Cloudy morning.
4-Jul	O	West	1	3	12.0	22.0	15.5	38	-4	LT	Cloudy morning, sunny evening.
5-Jul	O	North	1	2	9.0	23.0	16.0	35	-3	LT	Hot and sunny.
6-Jul	O	West	1	3	9.0	24.0	15.0	34	-2	LT	Very warm afternoon.
7-Jul	I	Variable	1	4	12.0	22.0	15.0	33	-1	CL	Occassional down pours.
8-Jul	I	O		4	12.0	21.0	15.0	32	-1	CL	Occassional down pours.
9-Jul	I	O	0	3	4.0	21.0	14.0	32	0	CL	Cleared up in late evening.
10-Jul	I	Variable	1	3	5.0	13.0	15.0	32	0	CL	
11-Jul	O	O		1	5.0	18.0	17.0	31	-1	LT	
12-Jul	O	O		1	3.0	19.0	15.0	29	-2	CL	
13-Jul	I	O		1	4.0	13.0	15.0	28	-1	CL	Rained continously from 12:00.
14-Jul	R	North	1	4	12.0	18.0	13.0	30	2	LT	Rain continues nonstop.
15-Jul	R	North	2	4	8.0	12.0	12.0	41	11	LT	
16-Jul	I	North	1	4	10.0	14.0	12.0	75	34	BR	New measuring device put in.
17-Jul	R	North	2	4	8.0	16.0	12.0	75	0	BR	New measuring device put in.
18-Jul	I	North	1	4	3.0	14.0	13.0	70	-6	BR	
19-Jul	I	Variable	1	4	2.0	15.0	13.0	64	-6	BR	Water a little clearer.
20-Jul	I	B	1	4	8.0	12.0	12.0	56	-8	BR	
21-Jul	I	B	1	3	4.0	18.0	12.0	56	0	LT	
22-Jul	O	B	1	2	2.0	20.0	12.0	56	0	LT	New measuring device put in.
23-Jul	I	B	1	3	6.0	18.0	11.0	51	-5	LT	
24-Jul	I	B	2	3	7.0	14.0	10.0	46	-5	LT	
25-Jul	I	B	2	3	5.0	15.0	10.0	41	-5	CL	
26-Jul	I	S	2	3	5.0	15.0	10.0	34	-7	CL	
27-Jul	I	Variable	2	4	3.0	14.0	10.0	32	-2	CL	
28-Jul	I	North	2	3	0.0	10.0				CL	
29-Jul	I	North	2	3	0.0	11.0				CL	

Weather Codes

SKY

0 No observation made.
1 Clear sky, cloud cover < 10% of sky.
2 Cloud cover 10% - 50% of sky.
3 Cloud cover > 50% of sky.
4 Completely overcast.
5 Fog or thick haze or smoke.

PRECIPITATION

I rmittent rain
R itinuous rain
S Snow
S&R l snow and rain
H Hail
T nder showers

WATER COLOR

Cl Clear
Lt Light Brown
Br Brown
Dk Dark Brown
Tr Turbid: murky or glacial

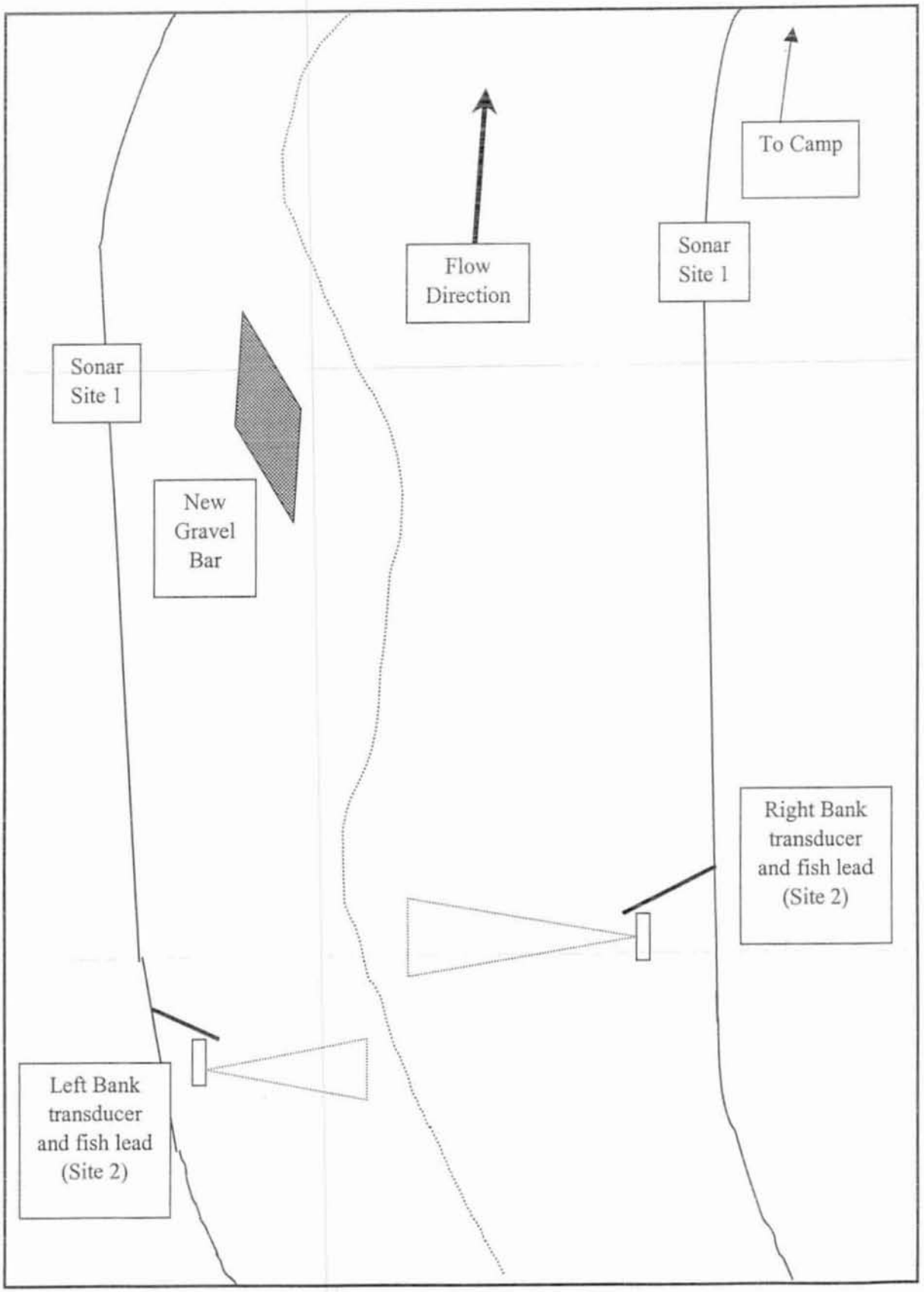


Figure 3. Anvik River summer chum salmon sonar site area, 2000.

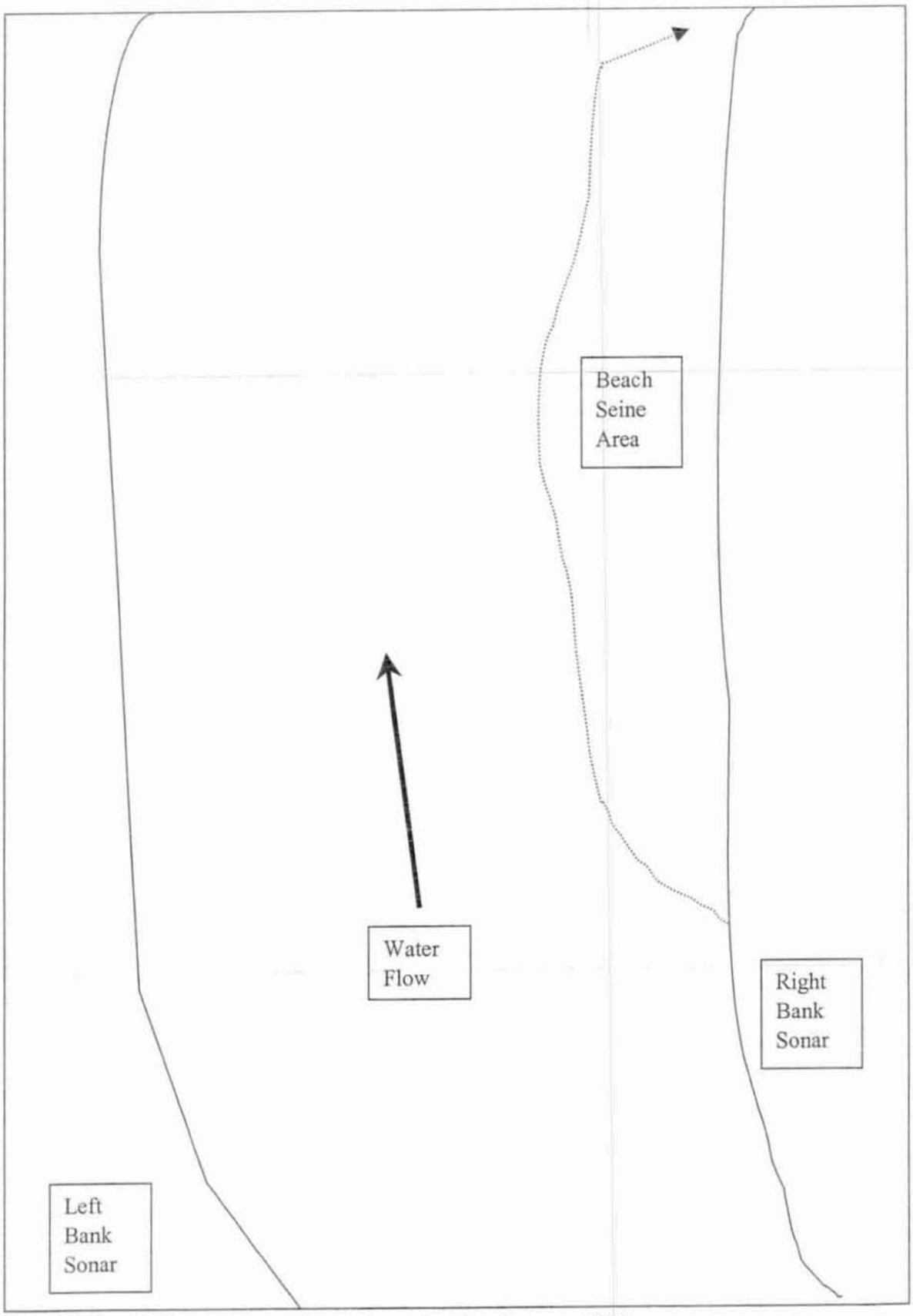


Figure 4. Anvik River summer chum salmon beach seine area, 2000.

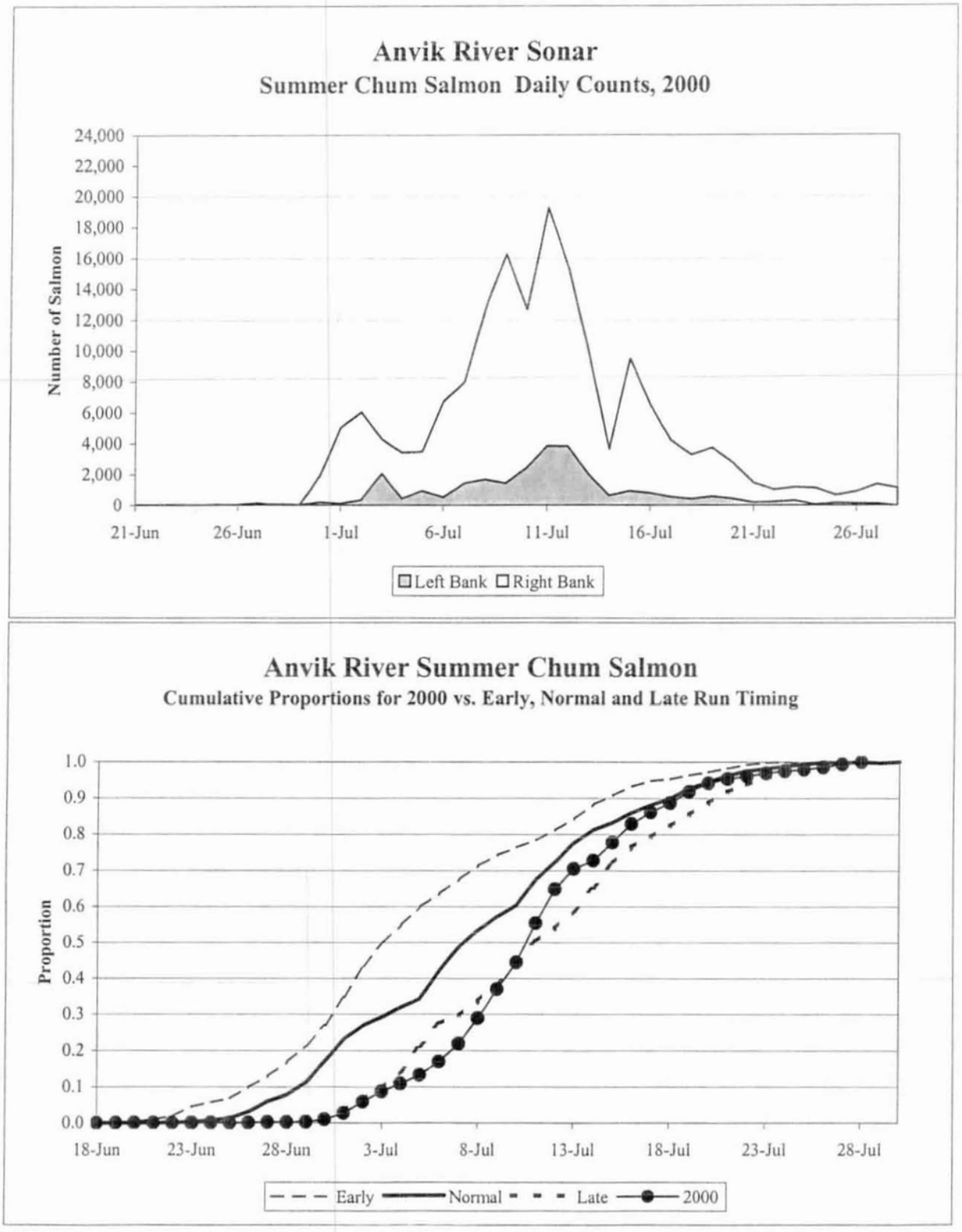
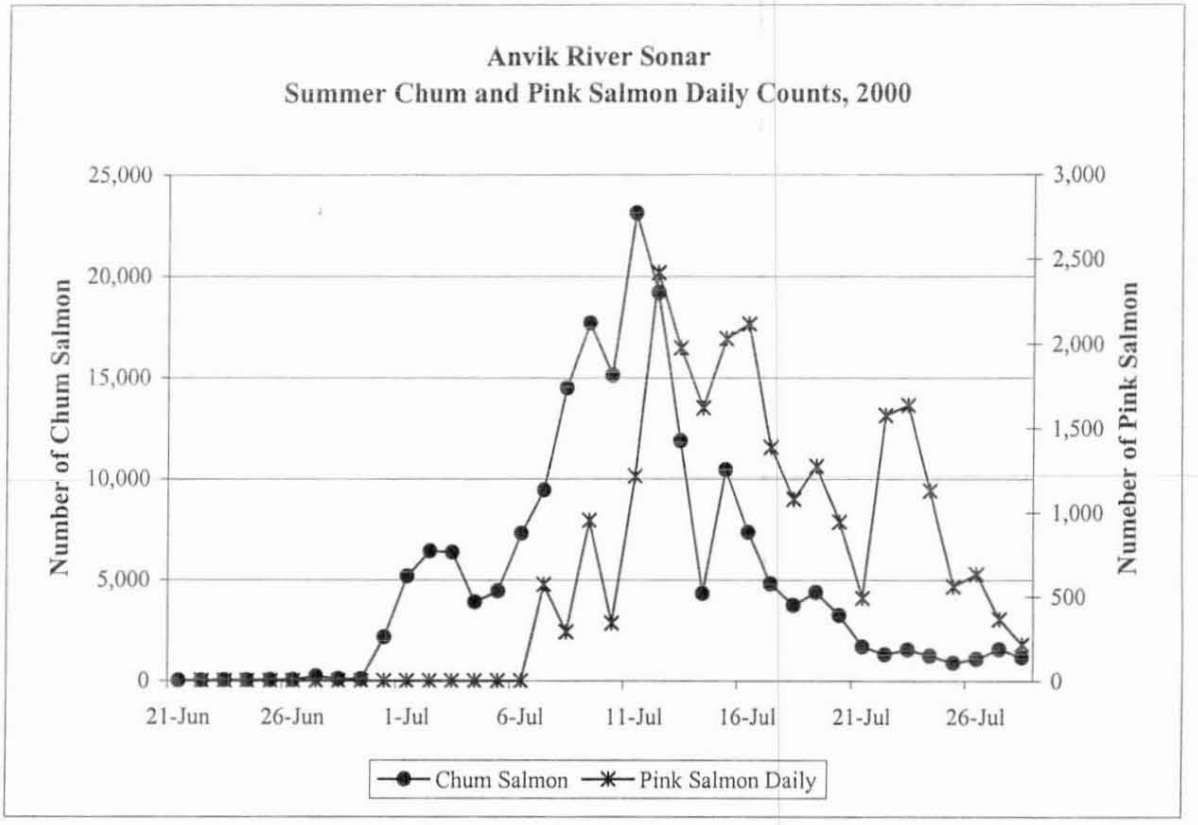


Figure 5. Anvik River summer chum salmon estimated daily escapement by bank and the 2000 cumulative escapement compared to Early, Normal and Late run timing base on historical run timing.



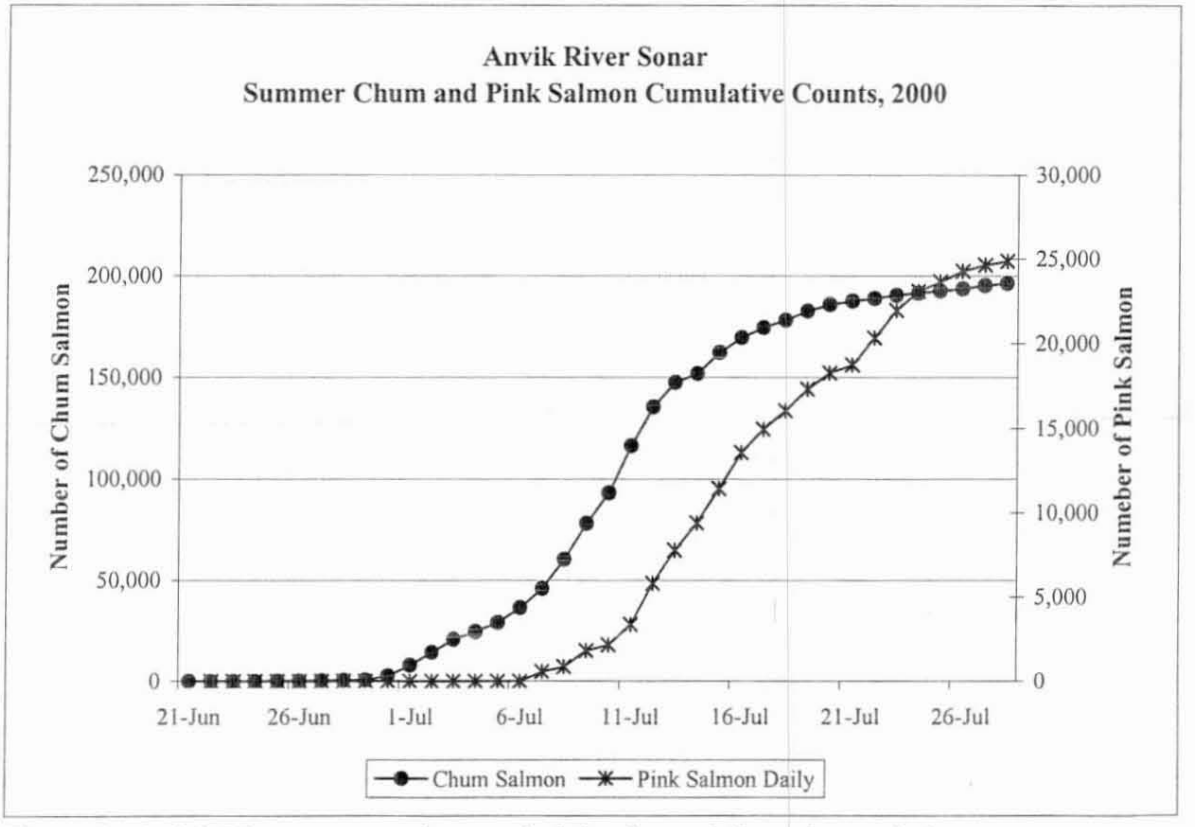


Figure 6. Anivk River summer chum and pink salmon daily and cumulative escapement estimates, 2000.

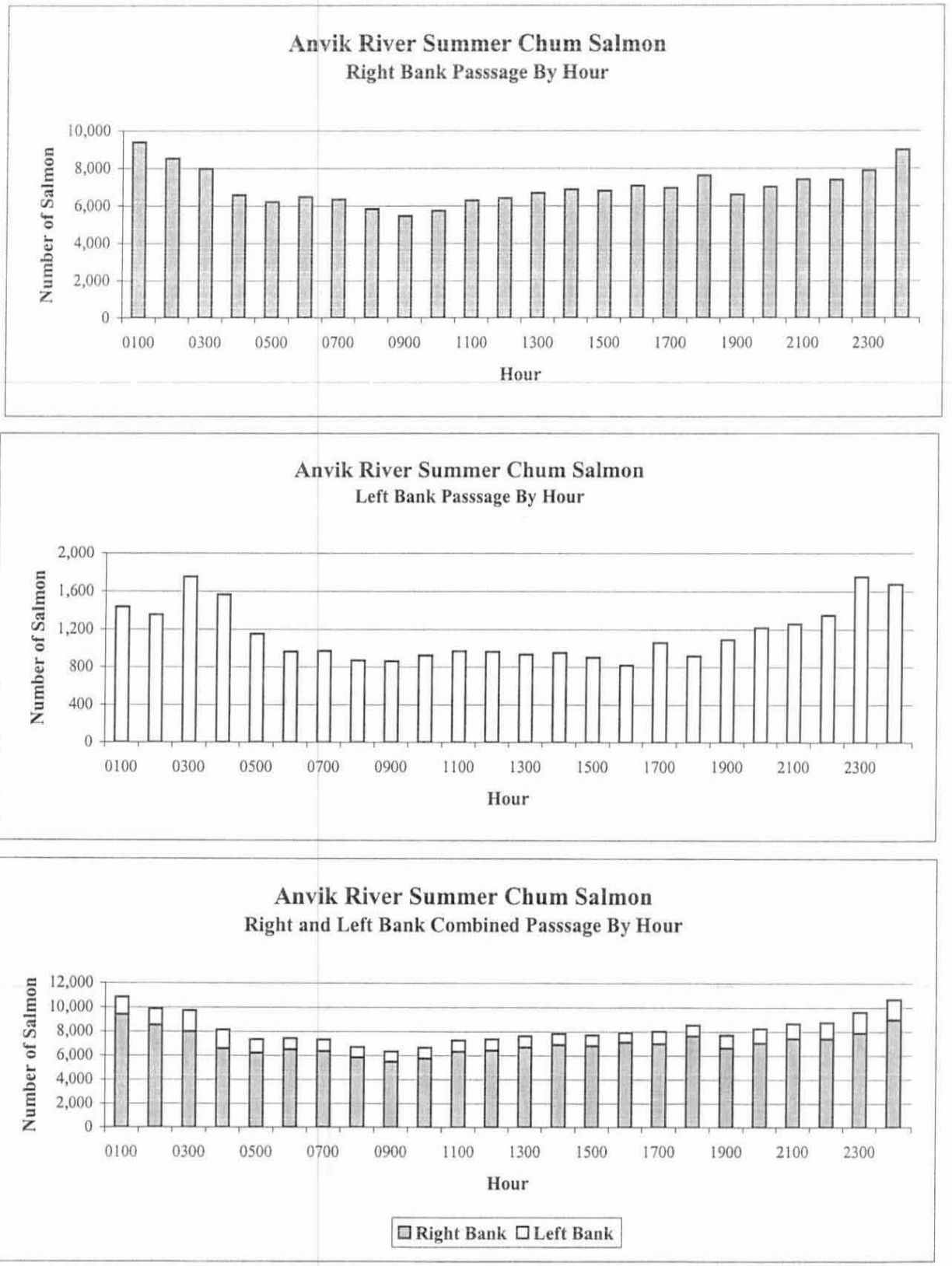
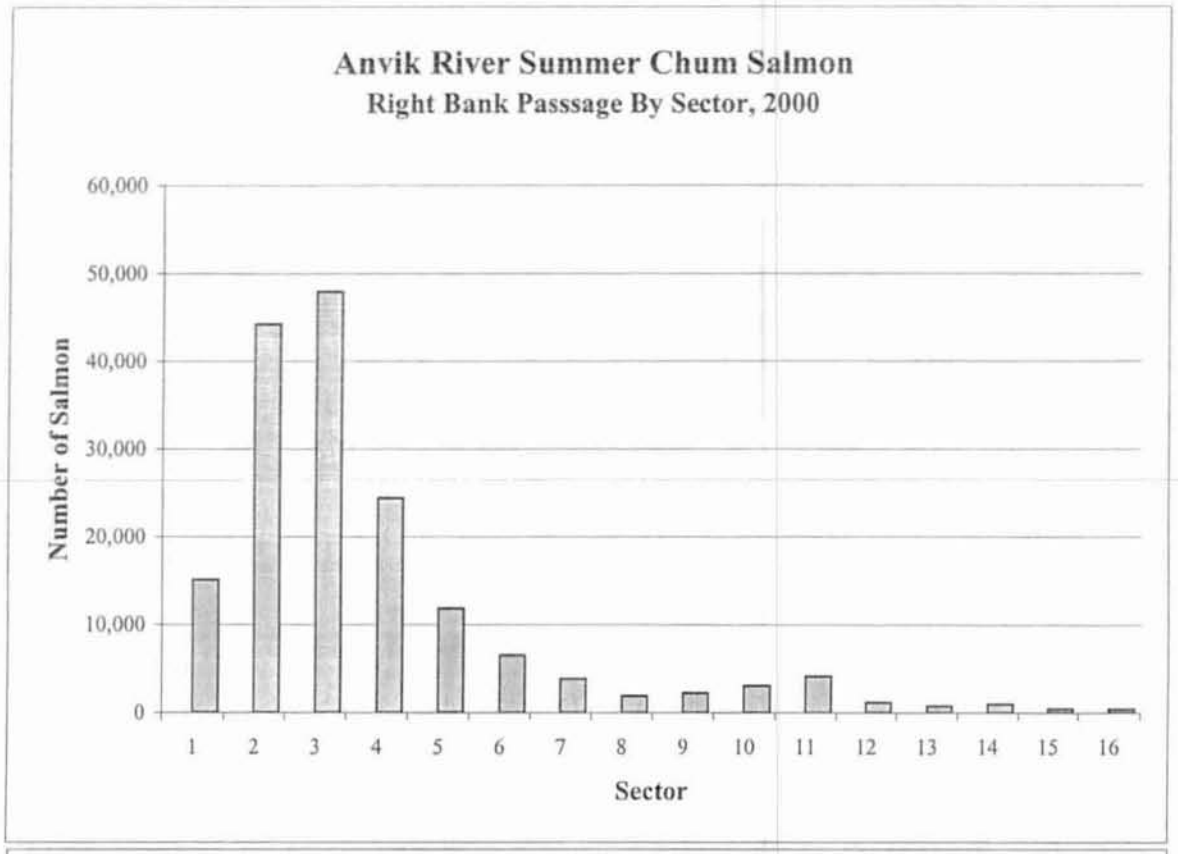


Figure 7. Anvik River summer chum salmon estimated passage by hour for left bank, right bank and both banks combined, 2000.



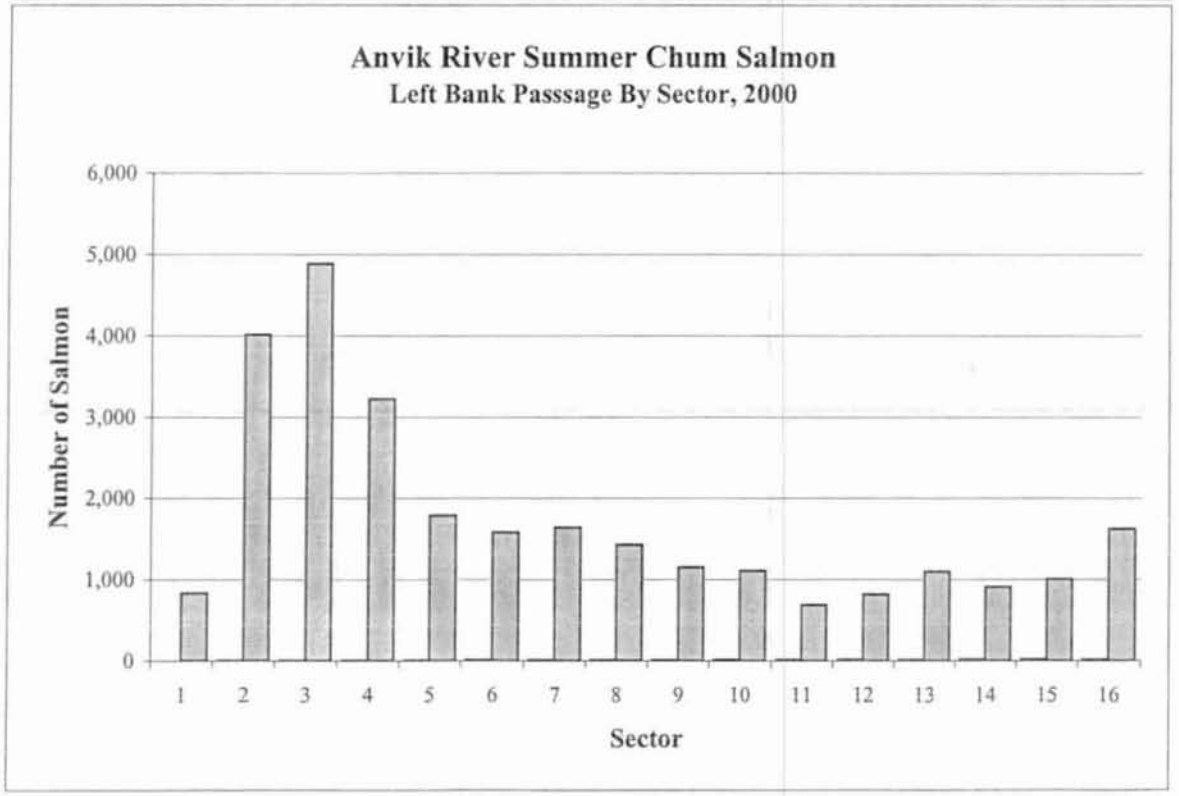
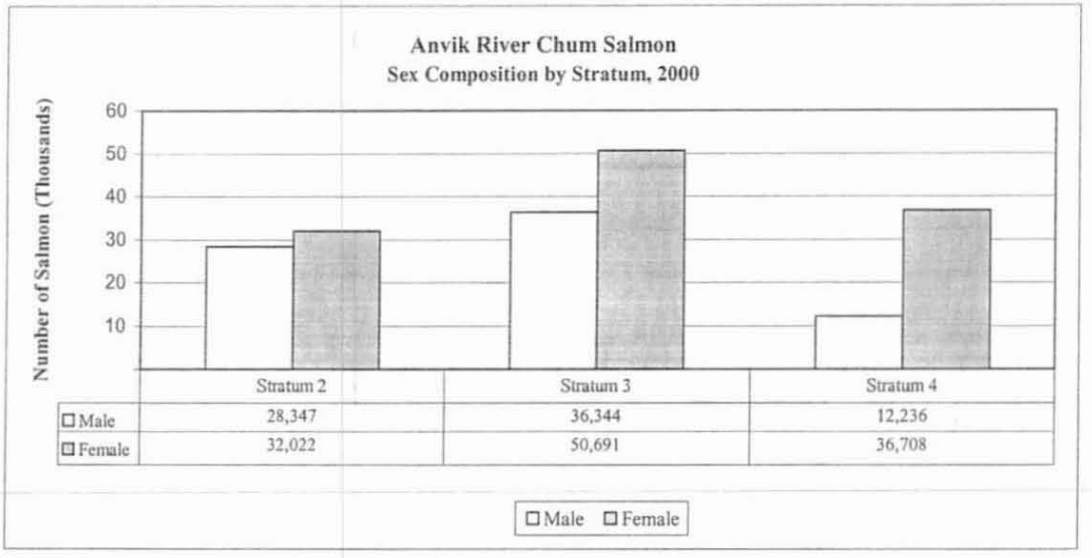
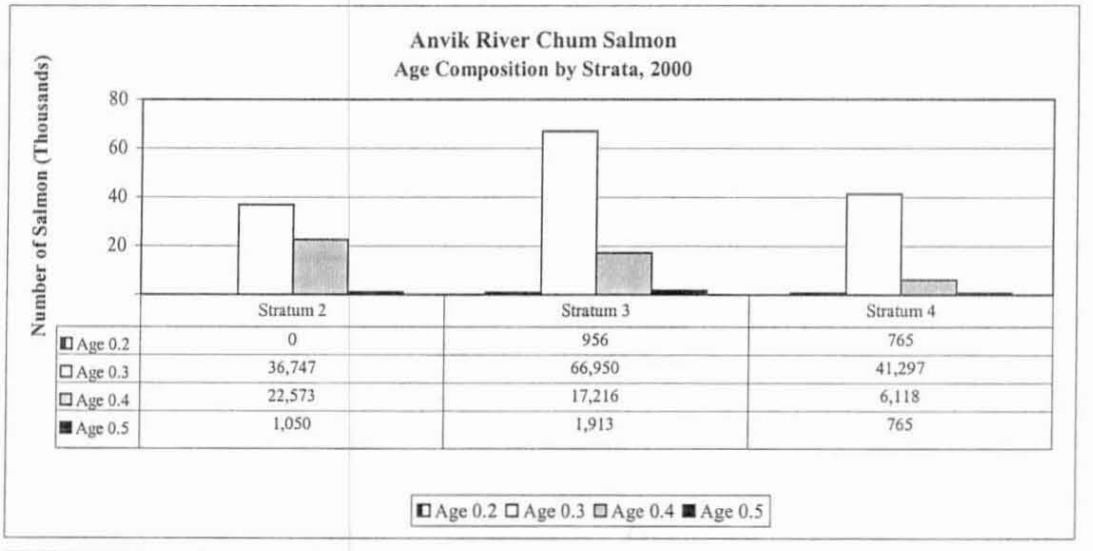


Figure 8. Anvik River summer chum estimated passage by sector for left and right banks, 2000.





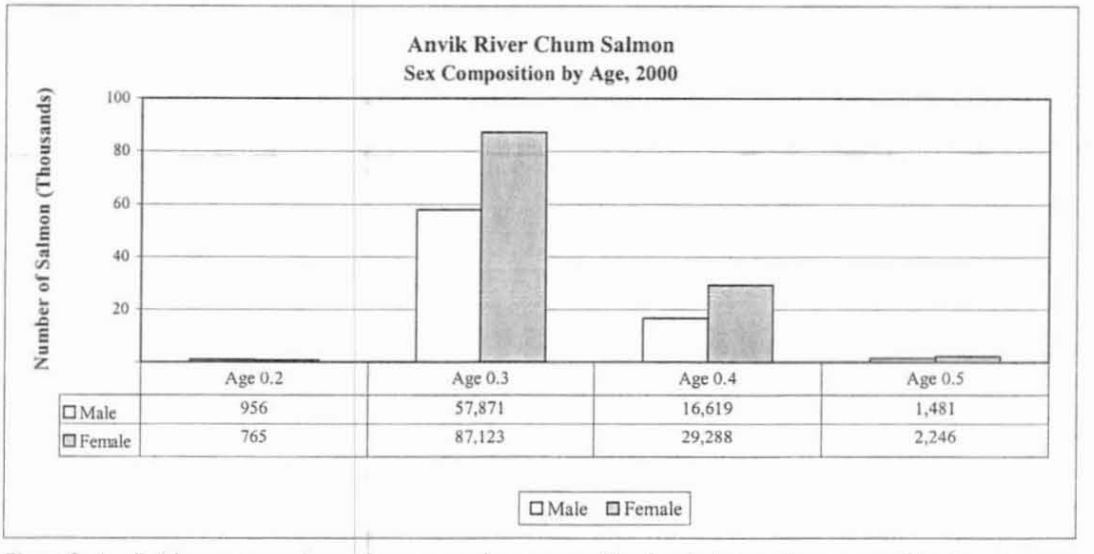
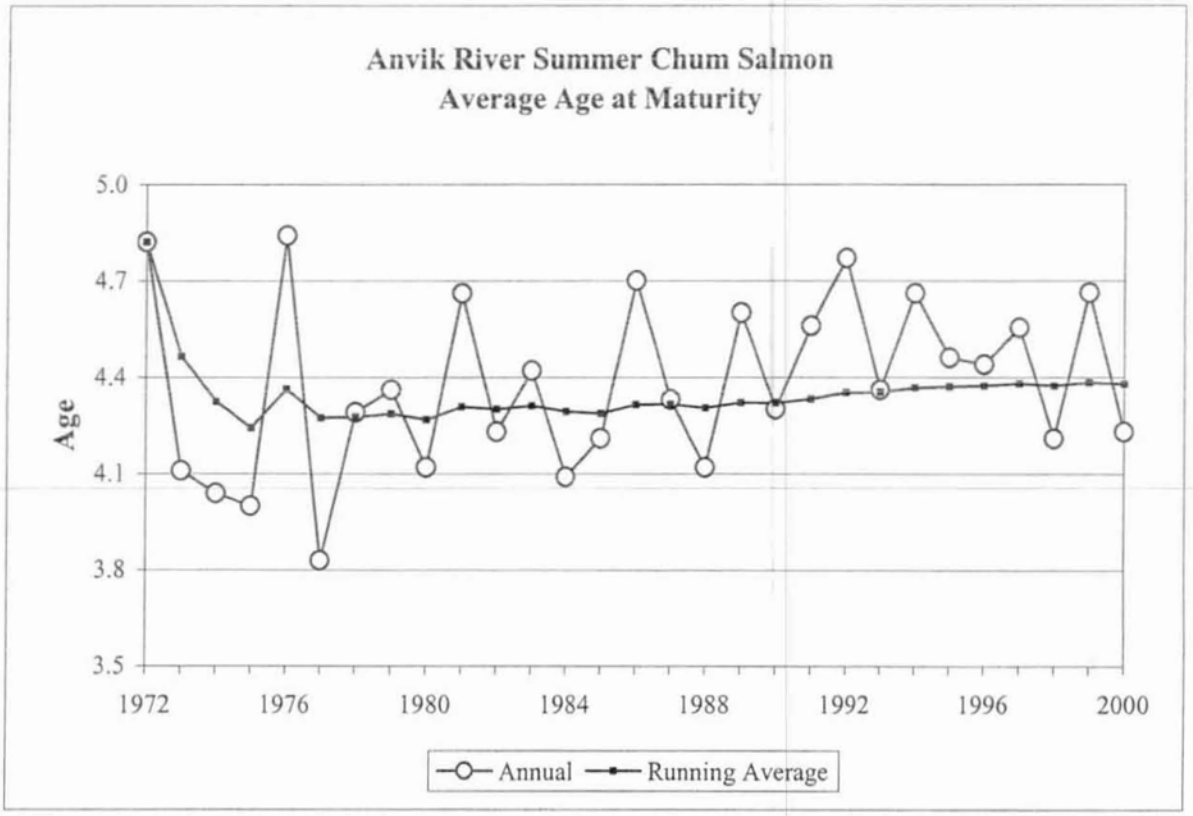


Figure 9. Anvik River summer chum salmon age and sex composition by stratum, and sex composition by age group, 2000.



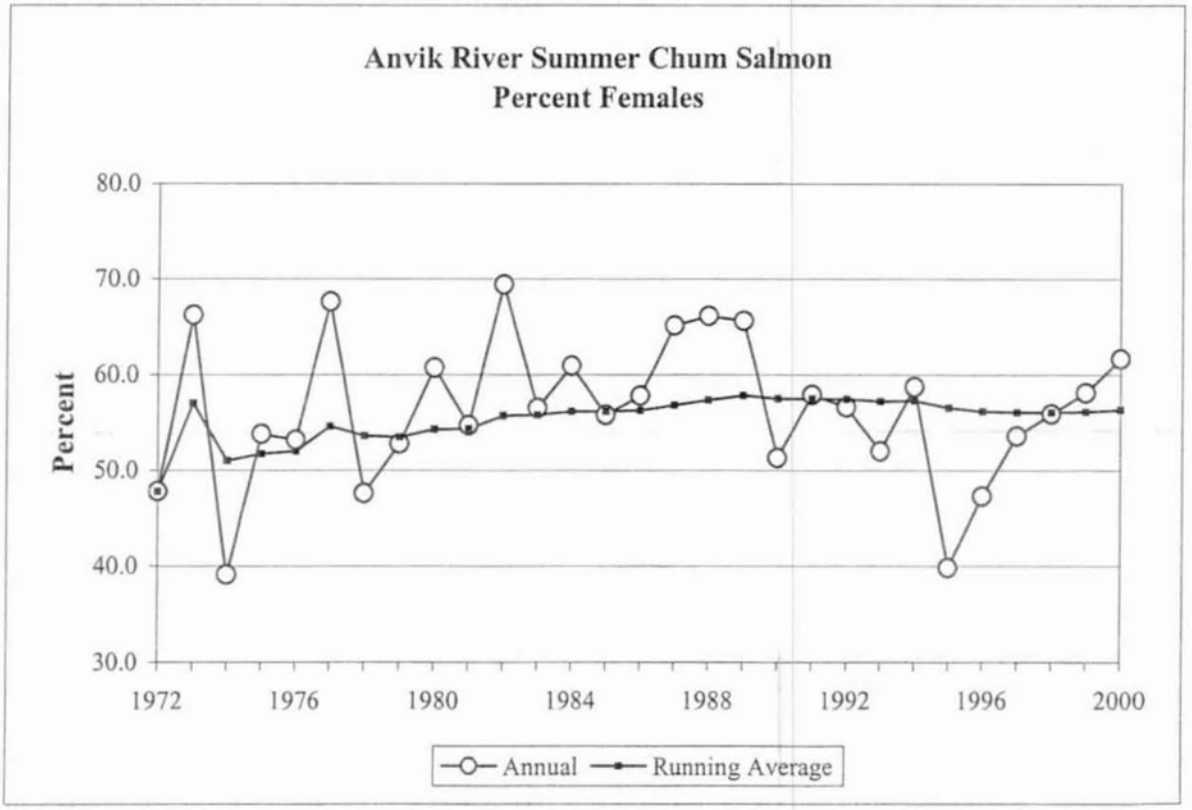
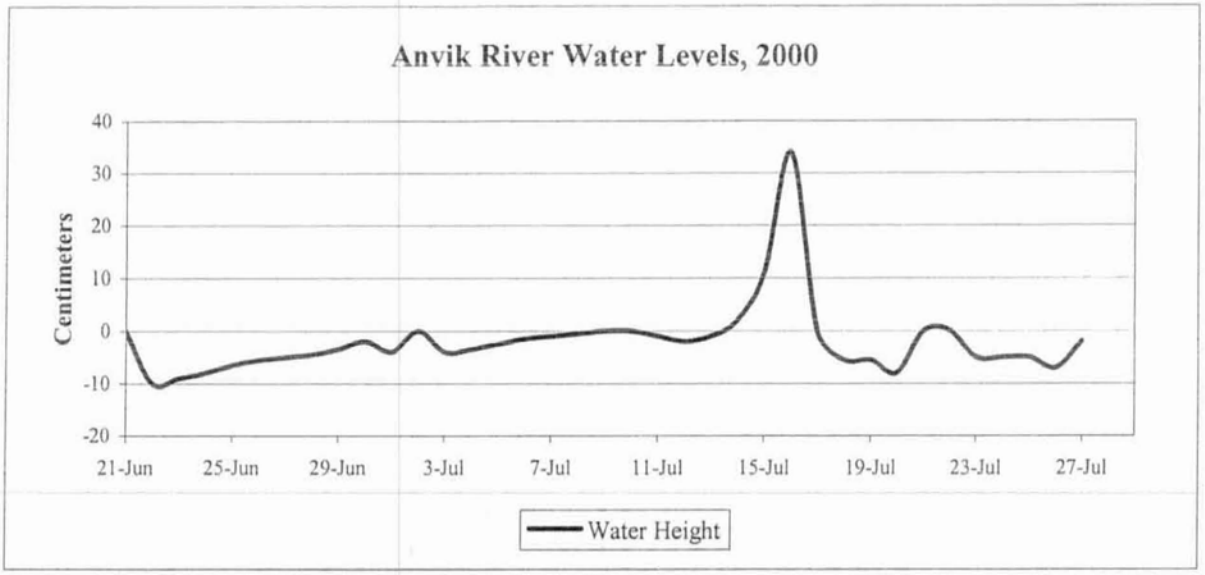
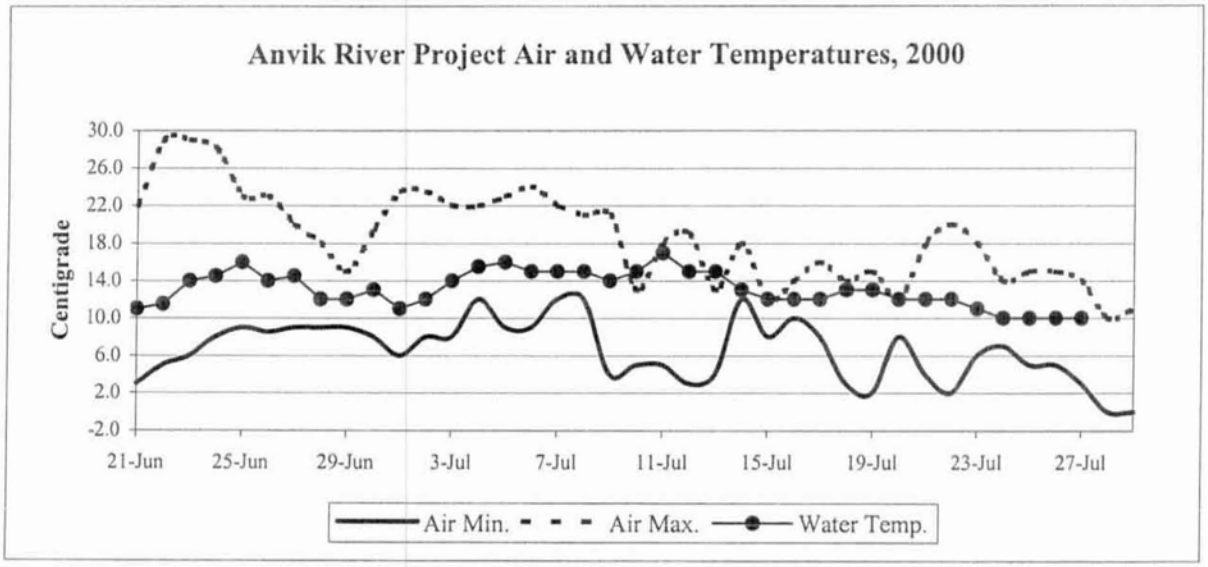


Figure 10. Annual age at maturity (top) and percentage of females (bottom) of the Anvik River chum salmon escapements, 1972-2000.





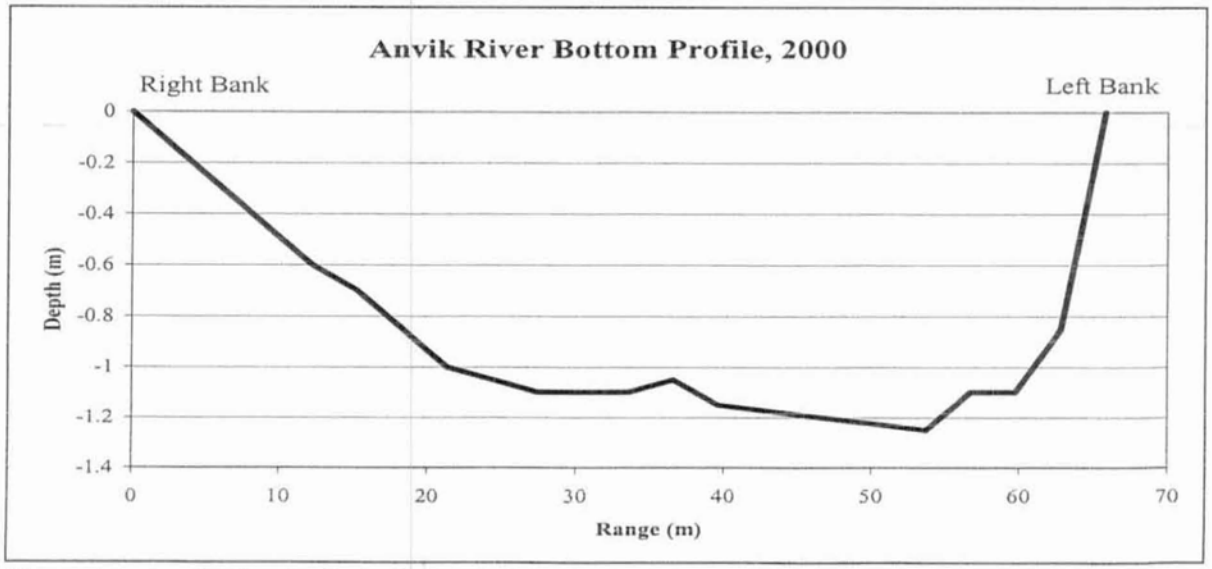


Figure 11. Anvik River hydrological and climatological observations at the sonar site, 2000.

Appendix Tables

Appendix Table A.1. Historic daily and cumulative Anvik River summer chum salmon escapements, 1979-2000.

	1979		1980		1981		1982	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun								
19-Jun								
20-Jun					2,760	2,760		
21-Jun					5,795	8,555		
22-Jun					8,226	16,781		
23-Jun	813	813			54,097	70,878		
24-Jun	1,679	2,492			91,826	162,704		
25-Jun	1,549	4,041			115,356	278,060	715	715
26-Jun	1,926	5,967			82,910	360,970	2,436	3,151
27-Jun	5,639	11,606	839	839	44,491	405,461	6,026	9,177
28-Jun	8,469	20,075	3,688	4,527	36,737	442,198	3,744	12,921
29-Jun	11,232	31,307	7,604	12,131	111,356	553,554	3,669	16,590
30-Jun	18,211	49,518	17,528	29,659	69,581	623,135	4,445	21,035
1-Jul	14,692	64,210	25,744	55,403	89,992	713,127	3,795	24,830
2-Jul	11,503	75,713	22,123	77,526	80,312	793,439	3,762	28,592
3-Jul	15,027	90,740	11,898	89,424	76,740	870,179	9,671	38,263
4-Jul	13,178	103,918	9,105	98,529	88,481	958,660	23,642	61,905
5-Jul	12,433	116,351	17,000	115,529	78,032	1,036,692	22,454	84,359
6-Jul	11,667	128,018	16,809	132,338	42,931	1,079,623	22,261	106,620
7-Jul	8,718	136,736	10,877	143,215	40,410	1,120,033	14,333	120,953
8-Jul	11,578	148,314	19,080	162,295	25,856	1,145,889	27,291	148,244
9-Jul	10,454	158,768	18,442	180,737	28,654	1,174,543	40,527	188,771
10-Jul	21,370	180,138	31,980	212,717	36,015	1,210,558	25,882	214,653
11-Jul	16,770	196,908	29,926	242,643	61,612	1,272,170	19,988	234,641
12-Jul	22,118	219,026	17,757	260,400	38,459	1,310,629	36,197	270,838
13-Jul	13,709	232,735	23,542	283,942	18,149	1,328,778	33,836	304,674
14-Jul	10,114	242,849	30,746	314,688	20,979	1,349,757	33,232	337,906
15-Jul	8,612	251,461	33,689	348,377	30,072	1,379,829	18,757	356,663
16-Jul	7,449	258,910	29,092	377,469	23,569	1,403,398	13,672	370,335
17-Jul	4,375	263,285	23,053	400,522	15,523	1,418,921	14,982	385,317
18-Jul	2,751	266,036	29,042	429,564	7,766	1,426,687	12,970	398,287
19-Jul	2,810	268,846	19,761	449,325	9,809	1,436,496	11,402	409,689
20-Jul	2,705	271,551	14,676	464,001	9,922	1,446,418	7,566	417,255
21-Jul	3,436	274,987	8,117	472,118	6,041	1,452,459	7,455	424,710
22-Jul	1,276	276,263	6,202	478,320	6,397	1,458,856	5,352	430,062
23-Jul	1,449	277,712	814	479,134	10,063	1,468,919	4,685	434,747
24-Jul			1,450	480,584	5,078	1,473,997	5,530	440,277
25-Jul			1,597	482,181	2,885	1,476,882	2,167	442,444
26-Jul					1,709	1,478,591	2,137	444,581
27-Jul					991	1,479,582		
28-Jul								
29-Jul								
30-Jul								
Total	277,712		482,181		1,479,582		444,581	

(Continued)

Appendix Table A.1. (Page 2 of 6).

	1983		1984		1985		1986	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/18								
6/19								
6/20								
6/21	217	217					234	234
6/22	1,351	1,568	293	293			2,970	3,204
6/23	1,430	2,998	307	600			4,894	8,098
6/24	3,293	6,291	404	1,004			12,192	20,290
6/25	10,836	17,127	11,528	12,532			15,769	36,059
6/26	12,533	29,660	16,740	29,272			18,392	54,451
6/27	10,132	39,792	23,824	53,096			34,844	89,295
6/28	16,227	56,019	16,855	69,951			88,531	177,826
6/29	10,894	66,913	26,456	96,407			100,102	277,928
6/30	23,141	90,054	25,756	122,163			117,778	395,706
7/1	21,532	111,586	18,148	140,311			111,472	507,178
7/2	11,146	122,732	21,584	161,895			89,247	596,425
7/3	15,906	138,638	24,471	186,366			58,444	654,869
7/4	13,669	152,307	28,122	214,488			58,997	713,866
7/5	11,653	163,960	23,509	237,997	7,998	7,998	39,913	753,779
7/6	9,505	173,465	40,714	278,711	47,245	55,243	55,902	809,681
7/7	11,792	185,257	45,103	323,814	56,091	111,334	45,280	854,961
7/8	17,499	202,756	53,194	377,008	58,578	169,912	40,688	895,649
7/9	20,358	223,114	80,563	457,571	60,265	230,177	41,088	936,737
7/10	22,898	246,012	58,385	515,956	61,952	292,129	37,960	974,697
7/11	22,800	268,812	60,851	576,807	63,641	355,770	28,766	1,003,463
7/12	18,866	287,678	71,000	647,807	96,664	452,434	16,250	1,019,713
7/13	15,618	303,296	64,041	711,848	128,110	580,544	14,092	1,033,805
7/14	16,348	319,644	40,196	752,044	109,585	690,129	23,838	1,057,643
7/15	6,972	326,616	24,561	776,605	77,433	767,562	28,107	1,085,750
7/16	8,628	335,244	18,008	794,613	63,007	830,569		
7/17	10,300	345,544	13,343	807,956	44,349	874,918		
7/18	7,404	352,948	13,013	820,969	37,498	912,416		
7/19	4,460	357,408	16,347	837,316	27,196	939,612		
7/20	2,465	359,873	17,643	854,959	35,903	975,515		
7/21	1,745	361,618	11,666	866,625	27,103	1,002,618		
7/22	843	362,461	5,534	872,159	22,272	1,024,890		
7/23	451	362,912	7,532	879,691	14,768	1,039,658		
7/24			4,091	883,782	11,554	1,051,212		
7/25			2,325	886,107	10,031	1,061,243		
7/26			2,841	888,948	8,133	1,069,376		
7/27			2,080	891,028	5,977	1,075,353		
7/28					4,890	1,080,243		
7/29								
7/30								
Total	362,912		891,028		1,080,243		1,085,750	

(Continued)

Appendix Table A.1. (Page 3 of 6).

	1987		1988		1989		1990	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun								
19-Jun								
20-Jun					162	162		
21-Jun	202	202	2,503	2,503	497	659		
22-Jun	339	541	1,092	3,595	2,244	2,903	158	158
23-Jun	425	966	1,841	5,436	4,919	7,822	1,515	1,673
24-Jun	467	1,433	1,853	7,289	5,258	13,080	1,603	3,276
25-Jun	605	2,038	5,264	12,553	7,268	20,348	1,838	5,114
26-Jun	1,586	3,624	9,187	21,740	7,353	27,701	7,419	12,533
27-Jun	3,043	6,667	24,682	46,422	17,792	45,493	14,742	27,275
28-Jun	3,731	10,398	57,538	103,960	21,632	67,125	5,830	33,105
29-Jun	6,401	16,799	96,842	200,802	33,533	100,658	15,800	48,905
30-Jun	14,571	31,370	84,240	285,042	36,228	136,886	19,919	68,824
1-Jul	8,637	40,007	94,566	379,608	37,460	174,346	26,093	94,917
2-Jul	13,065	53,072	104,891	484,499	33,743	208,089	25,566	120,483
3-Jul	14,974	68,046	73,286	557,785	29,033	237,122	22,724	143,207
4-Jul	21,226	89,272	57,432	615,217	24,058	261,180	12,268	155,475
5-Jul	25,487	114,759	60,081	675,298	25,797	286,977	24,385	179,860
6-Jul	36,536	151,295	68,021	743,319	22,668	309,645	16,799	196,659
7-Jul	25,139	176,434	40,829	784,148	23,907	333,552	11,987	208,646
8-Jul	16,094	192,528	42,795	826,943	28,232	361,784	11,669	220,315
9-Jul	6,074	198,602	46,130	873,073	27,763	389,547	12,419	232,734
10-Jul	11,533	210,135	25,614	898,687	20,790	410,337	11,197	243,931
11-Jul	11,624	221,759	23,131	921,818	21,804	432,141	28,262	272,193
12-Jul	13,444	235,203	30,350	952,168	28,737	460,878	14,091	286,284
13-Jul	23,464	258,667	30,468	982,636	33,821	494,699	6,170	292,454
14-Jul	29,136	287,803	26,287	1,008,923	26,856	521,555	4,872	297,326
15-Jul	35,855	323,658	27,474	1,036,397	30,602	552,157	3,535	300,861
16-Jul	28,964	352,622	15,922	1,052,319	17,803	569,960	5,673	306,534
17-Jul	15,179	367,801	5,340	1,057,659	5,003	574,963	11,394	317,928
18-Jul	13,744	381,545	12,676	1,070,335	10,460	585,423	7,304	325,232
19-Jul	13,599	395,144	11,987	1,082,322	10,035	595,458	7,535	332,767
20-Jul	16,658	411,802	5,382	1,087,704	10,872	606,330	10,970	343,737
21-Jul	13,530	425,332	7,000	1,094,704	8,299	614,629	10,280	354,017
22-Jul	9,148	434,480	5,323	1,100,027	5,300	619,929	11,819	365,836
23-Jul	8,301	442,781	5,460	1,105,487	5,490	625,419	10,739	376,575
24-Jul	6,518	449,299	6,264	1,111,751	3,366	628,785	10,662	387,237
25-Jul	3,813	453,112	8,105	1,119,856	3,827	632,612	3,403	390,640
26-Jul	2,764	455,876	4,378	1,124,234	4,294	636,906	3,663	394,303
27-Jul			1,215	1,125,449			3,181	397,484
28-Jul							2,724	400,208
29-Jul							2,216	402,424
30-Jul							1,203	403,627
Total	455,876		1,125,449		636,906		403,627	

(Continued)

Appendix Table A.1. (Page 4 of 6).

	1991		1992		1993		1994	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
6/18								
6/19					185	185	279	279
6/20					1,068	1,253	1,392	1,671
6/21	22	22	0	0	10,606	11,859	2,316	3,987
6/22	112	134	0	0	5,564	17,423	2,489	6,476
6/23	1,652	1,786	0	0	5,348	22,771	9,694	16,170
6/24	2,279	4,065	0	0	2,240	25,011	16,985	33,155
6/25	8,263	12,328	0	0	1,215	26,226	26,789	59,944
6/26	22,209	34,537	0	0	4,916	31,142	38,879	98,823
6/27	27,704	62,241	0	0	4,969	36,111	32,807	131,630
6/28	44,919	107,160	0	0	3,703	39,814	24,563	156,193
6/29	40,384	147,544	121	121	2,186	42,000	16,679	172,872
6/30	26,729	174,273	4,807	4,928	5,302	47,302	40,910	213,782
7/1	27,946	202,219	20,059	24,987	11,294	58,596	75,582	289,364
7/2	25,607	227,826	41,940	66,927	17,247	75,843	50,288	339,652
7/3	20,499	248,325	56,972	123,899	14,622	90,465	38,322	377,974
7/4	22,438	270,763	60,901	184,800	21,548	112,013	24,661	402,635
7/5	18,578	289,341	81,125	265,925	19,782	131,795	54,242	456,877
7/6	13,939	303,280	60,959	326,884	18,380	150,175	52,855	509,732
7/7	13,887	317,167	52,314	379,198	21,856	172,031	51,181	560,913
7/8	38,260	355,427	57,138	436,336	12,183	184,214	84,341	645,254
7/9	58,068	413,495	59,744	496,080	17,018	201,232	57,076	702,330
7/10	45,739	459,234	41,593	537,673	26,667	227,899	71,095	773,425
7/11	45,295	504,529	30,892	568,565	20,962	248,861	88,585	862,010
7/12	33,138	537,667	28,065	596,630	28,977	277,838	45,795	907,805
7/13	32,539	570,206	26,358	622,988	20,952	298,790	33,023	940,828
7/14	29,932	600,138	19,458	642,446	16,878	315,668	28,019	968,847
7/15	26,330	626,468	17,755	660,201	19,859	335,527	18,002	986,849
7/16	23,180	649,648	15,873	676,074	18,692	354,219	13,468	1,000,317
7/17	23,252	672,900	20,765	696,839	25,152	379,371	25,032	1,025,349
7/18	17,176	690,076	12,025	708,864	26,508	405,879	27,190	1,052,539
7/19	13,163	703,239	9,854	718,718	21,339	427,218	26,148	1,078,687
7/20	17,168	720,407	7,282	726,000	22,573	449,791	11,762	1,090,449
7/21	20,051	740,458	11,563	737,563	19,510	469,301	7,412	1,097,861
7/22	26,610	767,068	9,928	747,491	11,351	480,652	14,192	1,112,053
7/23	28,801	795,869	11,314	758,805	6,779	487,431	12,636	1,124,689
7/24	21,070	816,939	9,002	767,807	5,903	493,334		
7/25	17,231	834,170	7,819	775,626	9,187	502,521		
7/26	13,602	847,772			8,076	510,597		
7/27					6,812	517,409		
7/28								
7/29								
7/30								
Total	847,772		775,626		517,409		1,124,689	

(Continued)

Appendix Table A.1. (Page 5 of 6).

	1995		1996		1997		1998	
	Daily	Cum.	Daily	Cum.	Daily	Cum.	Daily	Cum.
18-Jun			10,213	10,213				
19-Jun	395	395	4,615	14,828	561	561		
20-Jun	3,648	4,043	16,836	31,664	5,761	6,321		
21-Jun	5,831	9,874	43,565	75,229	8,403	14,724	1	1
22-Jun	11,639	21,513	34,257	109,486	5,072	19,796	164	165
23-Jun	6,459	27,972	50,000	159,486	22,395	42,191	1,202	1,367
24-Jun	8,723	36,695	63,193	222,679	29,758	71,949	2,103	3,471
25-Jun	15,302	51,997	28,156	250,835	23,643	95,592	3,175	6,646
26-Jun	9,389	61,386	35,303	286,138	7,181	102,773	4,161	10,807
27-Jun	36,645	98,031	46,390	332,528	19,719	122,493	4,721	15,528
28-Jun	78,678	176,709	34,348	366,876	29,291	151,784	4,210	19,738
29-Jun	87,951	264,660	33,115	399,991	36,752	188,536	4,868	24,606
30-Jun	52,897	317,557	45,936	445,927	31,248	219,783	8,063	32,669
1-Jul	53,297	370,854	58,459	504,386	32,374	252,157	14,597	47,266
2-Jul	82,228	453,082	55,211	559,597	28,963	281,120	14,835	62,101
3-Jul	59,206	512,288	39,335	598,932	28,931	310,051	24,539	86,640
4-Jul	27,695	539,983	44,112	643,044	26,746	336,797	22,857	109,496
5-Jul	50,642	590,625	61,740	704,784	26,575	363,372	25,589	135,085
6-Jul	105,422	696,047	38,482	743,266	20,109	383,481	34,503	169,588
7-Jul	105,992	802,039	49,067	792,333	24,365	407,847	35,114	204,702
8-Jul	55,108	857,147	34,221	826,554	24,356	432,202	16,755	221,457
9-Jul	38,646	895,793	23,194	849,748	15,851	448,054	14,740	236,196
10-Jul	60,116	955,909	18,093	867,841	13,710	461,764	20,959	257,156
11-Jul	64,070	1,019,979	10,579	878,420	11,550	473,315	27,179	284,335
12-Jul	41,220	1,061,199	13,038	891,458	7,663	480,977	35,455	319,790
13-Jul	39,638	1,100,837	12,871	904,329	4,803	485,780	35,331	355,121
14-Jul	33,743	1,134,580	10,077	914,406	8,467	494,246	20,702	375,822
15-Jul	39,977	1,174,557	7,411	921,817	12,436	506,683	8,195	384,017
16-Jul	30,640	1,205,197	7,173	928,990	15,943	522,626	18,556	402,574
17-Jul	24,950	1,230,147	4,250	933,240	12,682	535,308	14,564	417,138
18-Jul	25,638	1,255,785			13,040	548,348	12,179	429,318
19-Jul	16,814	1,272,599			14,631	562,979	16,685	446,003
20-Jul	26,622	1,299,221			12,826	575,806	11,525	457,528
21-Jul	19,154	1,318,375			11,684	587,490	10,702	468,230
22-Jul	11,735	1,330,110			10,177	597,667	10,020	478,250
23-Jul	5,982	1,336,092			4,701	602,368	6,082	484,332
24-Jul	3,326	1,339,418			3,384	605,752	2,969	487,301
25-Jul								
26-Jul								
27-Jul								
28-Jul								
29-Jul								
30-Jul								
Total	1,339,418		933,240		605,752		487,301	

(Continued)

Appendix Table A.1. (Page 6 of 6).

	1999		2000	
	Daily	Cum.	Daily	Cum.
18-Jun				
19-Jun				
20-Jun				
21-Jun			10	10
22-Jun			9	19
23-Jun			28	47
24-Jun			25	72
25-Jun			49	121
26-Jun			49	170
27-Jun	85	85	218	388
28-Jun	274	359	97	485
29-Jun	1,546	1,905	104	589
30-Jun	3,176	5,081	2,167	2,756
1-Jul	10,336	15,417	5,174	7,930
2-Jul	11,038	26,455	6,427	14,357
3-Jul	15,497	41,952	6,369	20,727
4-Jul	20,660	62,612	3,904	24,631
5-Jul	31,112	93,724	4,457	29,088
6-Jul	27,755	121,479	7,322	36,410
7-Jul	33,489	154,968	9,465	45,875
8-Jul	28,502	183,470	14,495	60,370
9-Jul	22,090	205,560	17,712	78,082
10-Jul	28,185	233,745	15,124	93,206
11-Jul	21,647	255,392	23,105	116,311
12-Jul	17,370	272,761	19,212	135,523
13-Jul	15,215	287,976	11,882	147,405
14-Jul	13,615	301,591	4,334	151,739
15-Jul	13,034	314,626	10,464	162,202
16-Jul	17,692	332,318	7,362	169,565
17-Jul	14,841	347,159	4,816	174,380
18-Jul	13,842	361,001	3,750	178,130
19-Jul	15,313	376,314	4,384	182,515
20-Jul	13,196	389,511	3,244	185,758
21-Jul	12,888	402,398	1,706	187,464
22-Jul	8,474	410,873	1,318	188,782
23-Jul	8,485	419,358	1,567	190,349
24-Jul	6,452	425,810	1,255	191,604
25-Jul	4,484	430,294	907	192,510
26-Jul	2,465	432,759	1,102	193,612
27-Jul	2,747	435,506	1,569	195,181
28-Jul	1,850	437,356	1,168	196,349
29-Jul				
30-Jul				
Total	437,356		196,349	

Appendix Table B.1. Right bank Anvik River summer chum salmon counts by hour and sector, 2000.

	Sector																	Total
Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
0000 - 0100	857	2,297	2,564	1,395	864	448	225	92	87	150	341	33	53	38	16	18	9,479	9,389
0100 - 0200	1,262	2,282	2,132	1,259	621	361	206	85	76	88	77	25	11	48	11	7	8,551	8,515
0200 - 0300	1,343	2,113	1,952	1,077	553	301	147	75	59	87	287	22	13	5	4	3	8,041	7,972
0300 - 0400	1,202	1,720	1,564	967	525	299	149	43	47	56	73	14	10	15	11	8	6,702	6,586
0400 - 0500	908	1,610	1,615	856	587	297	169	63	54	68	62	46	14	9	2	12	6,371	6,209
0500 - 0600	657	1,646	1,941	998	507	280	152	66	44	73	74	27	21	22	13	25	6,547	6,482
0600 - 0700	481	1,347	2,012	1,044	582	343	152	103	65	92	93	45	18	14	22	21	6,434	6,352
0700 - 0800	379	1,457	2,011	975	470	236	129	60	52	78	56	26	18	10	12	15	5,984	5,830
0800 - 0900	341	1,275	1,743	975	505	274	117	54	52	62	88	26	8	20	7	6	5,552	5,467
0900 - 1000	279	1,225	1,855	973	496	263	151	66	33	106	138	29	18	12	12	4	5,658	5,734
1000 - 1100	349	1,350	1,952	1,159	455	262	139	47	58	107	186	57	23	26	9	8	6,187	6,300
1100 - 1200	394	1,425	1,868	1,082	501	287	162	110	66	133	191	85	38	43	12	13	6,411	6,412
1200 - 1300	481	1,718	1,790	1,017	577	340	191	105	127	173	172	48	37	25	16	10	6,825	6,690
1300 - 1400	494	1,691	1,773	1,001	475	340	262	124	116	207	285	66	29	41	27	16	6,948	6,880
1400 - 1500	520	1,866	1,989	992	417	280	152	95	136	132	152	84	47	37	21	28	6,947	6,814
1500 - 1600	573	2,173	2,051	861	318	183	217	103	256	194	139	33	30	74	6	15	7,225	7,098
1600 - 1700	650	2,022	1,961	864	324	190	104	51	84	99	279	64	39	59	28	44	6,861	6,963
1700 - 1800	713	2,550	2,132	830	366	172	129	74	113	222	226	97	41	85	41	15	7,805	7,619
1800 - 1900	417	2,014	1,972	918	382	165	180	85	181	158	294	109	34	28	9	26	6,970	6,612
1900 - 2000	540	2,122	2,662	959	404	233	117	98	93	128	156	46	44	44	25	19	7,690	7,036
2000 - 2100	642	2,309	2,305	912	437	201	114	86	79	148	186	40	44	31	18	12	7,563	7,416
2100 - 2200	556	2,298	2,340	936	429	206	107	71	84	147	200	55	26	40	15	15	7,525	7,399
2200 - 2300	497	2,077	2,315	1,029	495	256	173	81	122	170	282	43	68	57	39	24	7,728	7,869
2300 - 2400	662	2,465	2,791	1,350	612	308	160	72	89	161	190	45	43	168	26	21	9,164	8,983
Total	15,198	45,052	49,289	24,430	11,899	6,526	3,803	1,909	2,172	3,038	4,226	1,165	725	951	403	385	171,171	168,630
Adjusted	15,127	44,194	47,898	24,364	11,804	6,483	3,817	1,908	2,207	3,032	4,104	1,143	743	946	452	407	168,630	

Appendix Table B.2. Left bank Anvik River summer chum salmon counts by hour and sector, 2000.

	Sector																	Total
Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
0000 - 0100	38	230	339	220	115	88	81	61	38	38	33	16	13	12	20	75	1,417	1,438
0100 - 0200	73	321	366	205	86	65	73	48	20	23	16	9	12	17	17	17	1,369	1,353
0200 - 0300	107	576	462	244	111	78	70	35	11	22	4	7	9	6	15	16	1,772	1,751
0300 - 0400	89	419	378	226	137	92	71	48	26	19	12	15	13	13	27	28	1,613	1,565
0400 - 0500	47	229	294	192	89	61	71	49	20	30	10	9	9	16	14	16	1,155	1,152
0500 - 0600	34	99	205	132	77	66	81	72	64	44	17	14	14	10	15	23	966	963
0600 - 0700	24	73	159	110	87	73	78	78	33	55	28	36	46	22	27	48	977	973
0700 - 0800	22	113	154	111	64	44	38	39	37	31	25	46	50	23	27	67	890	871
0800 - 0900	25	82	109	90	48	51	57	36	25	46	39	38	64	37	61	66	874	863
0900 - 1000	23	76	114	62	74	73	52	33	50	52	23	43	64	41	50	117	948	925
1000 - 1100	22	90	151	98	75	56	56	46	46	35	27	29	45	55	65	83	979	970
1100 - 1200	22	79	123	114	67	70	105	71	41	48	22	35	76	45	43	57	1,019	965
1200 - 1300	21	74	93	81	75	79	70	73	76	41	26	54	66	51	43	46	968	935
1300 - 1400	21	119	87	86	68	80	86	75	46	49	32	20	39	49	52	66	973	954
1400 - 1500	29	107	90	87	44	38	49	56	48	59	56	37	47	50	70	63	929	902
1500 - 1600	23	107	85	61	28	41	60	41	58	49	29	41	52	57	61	75	868	821
1600 - 1700	18	113	138	119	48	52	61	77	27	64	20	36	76	73	83	91	1,096	1,061
1700 - 1800	23	105	120	74	36	43	44	54	40	53	29	50	68	75	54	66	932	917
1800 - 1900	16	105	132	107	56	56	69	64	78	61	37	38	88	83	58	74	1,121	1,093
1900 - 2000	30	133	137	122	72	83	110	107	98	68	39	37	58	47	42	79	1,260	1,217
2000 - 2100	42	174	186	122	56	74	68	76	92	53	44	59	55	28	49	82	1,261	1,257
2100 - 2200	32	197	258	138	81	75	91	76	51	57	38	46	58	50	41	67	1,356	1,348
2200 - 2300	27	269	425	216	79	73	62	57	103	90	62	75	36	38	45	99	1,754	1,751
2300 - 2400	39	222	321	227	108	71	71	99	51	47	40	45	68	35	40	205	1,690	1,675
Total	845	4,111	4,928	3,243	1,781	1,581	1,673	1,469	1,179	1,135	706	834	1,126	933	1,018	1,624	28,186	27,719
Adjusted	826	4,015	4,883	3,222	1,780	1,571	1,631	1,423	1,148	1,104	684	813	1,093	905	1,005	1,617	27,719	

Appendix Table B.3. Right and left bank Anvik River summer chum salmon counts by hour and sector, 2000.

	Sector																	Total
Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
0000 - 0100	895	2,526	2,904	1,615	979	536	306	153	125	188	374	49	66	50	36	93	10,896	10,827
0100 - 0200	1,335	2,603	2,498	1,463	708	426	279	133	95	111	93	34	24	65	28	24	9,920	9,868
0200 - 0300	1,451	2,689	2,415	1,321	664	379	217	110	70	110	291	29	22	11	18	18	9,813	9,723
0300 - 0400	1,292	2,139	1,941	1,193	661	391	220	91	73	76	85	29	23	28	38	36	8,315	8,151
0400 - 0500	955	1,838	1,909	1,047	675	358	240	113	74	98	72	55	22	24	16	29	7,526	7,361
0500 - 0600	691	1,745	2,146	1,130	584	346	233	138	109	117	91	41	35	32	28	48	7,513	7,445
0600 - 0700	505	1,420	2,171	1,155	669	416	230	182	98	147	121	81	64	36	49	69	7,412	7,325
0700 - 0800	400	1,570	2,165	1,086	534	280	168	99	89	109	82	72	68	32	39	82	6,874	6,702
0800 - 0900	366	1,357	1,852	1,065	553	325	174	89	77	108	127	64	72	57	68	72	6,426	6,330
0900 - 1000	302	1,301	1,968	1,035	570	336	203	99	83	158	161	73	81	53	62	121	6,606	6,659
1000 - 1100	372	1,440	2,103	1,257	530	318	195	93	104	142	213	86	68	80	74	90	7,166	7,269
1100 - 1200	416	1,504	1,991	1,196	568	357	267	181	107	181	213	120	114	89	55	70	7,430	7,377
1200 - 1300	502	1,792	1,883	1,098	651	418	261	178	203	213	197	102	103	75	59	55	7,793	7,625
1300 - 1400	516	1,810	1,860	1,086	543	420	348	199	162	255	317	86	68	90	79	82	7,921	7,834
1400 - 1500	548	1,973	2,080	1,079	461	318	201	151	184	191	208	121	94	86	91	91	7,876	7,716
1500 - 1600	595	2,280	2,136	922	346	223	277	144	314	243	168	74	82	130	67	90	8,093	7,919
1600 - 1700	668	2,135	2,099	984	372	241	165	127	111	163	298	100	115	132	111	135	7,957	8,025
1700 - 1800	736	2,655	2,251	903	402	215	172	128	153	275	255	146	109	161	95	80	8,737	8,537
1800 - 1900	433	2,119	2,104	1,025	438	221	249	148	259	220	330	146	123	111	66	100	8,091	7,705
1900 - 2000	569	2,255	2,799	1,081	476	316	227	205	191	196	195	83	102	91	67	98	8,950	8,253
2000 - 2100	683	2,483	2,491	1,034	493	275	182	162	172	200	229	100	99	59	68	94	8,824	8,673
2100 - 2200	588	2,495	2,598	1,073	509	281	198	147	135	204	237	102	84	90	56	82	8,881	8,747
2200 - 2300	524	2,346	2,740	1,245	574	329	234	138	225	260	343	118	104	95	84	123	9,482	9,620
2300 - 2400	701	2,687	3,112	1,578	719	379	232	171	140	208	230	90	111	203	67	226	10,855	10,658
Total	16,043	49,163	54,217	27,673	13,681	8,107	5,476	3,379	3,350	4,172	4,932	2,000	1,851	1,883	1,421	2,009	199,357	196,349
Adjusted	15,953	48,209	52,781	27,586	13,584	8,055	5,447	3,331	3,354	4,136	4,788	1,956	1,835	1,851	1,457	2,024	196,349	

Appendix Table B.4. Right bank Anvik River summer chum salmon proportions by hour and sector, 2000.

	Sector																	Total
Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
0000 - 0100	0.0051	0.0136	0.0152	0.0083	0.0051	0.0027	0.0013	0.0005	0.0005	0.0009	0.0020	0.0002	0.0003	0.0002	0.0001	0.0001	0.0562	0.0557
0100 - 0200	0.0075	0.0135	0.0126	0.0075	0.0037	0.0021	0.0012	0.0005	0.0004	0.0005	0.0005	0.0001	0.0001	0.0003	0.0001	0.0000	0.0507	0.0505
0200 - 0300	0.0080	0.0125	0.0116	0.0064	0.0033	0.0018	0.0009	0.0004	0.0003	0.0005	0.0017	0.0001	0.0001	0.0000	0.0000	0.0000	0.0477	0.0473
0300 - 0400	0.0071	0.0102	0.0093	0.0057	0.0031	0.0018	0.0009	0.0003	0.0003	0.0003	0.0004	0.0001	0.0001	0.0001	0.0001	0.0000	0.0397	0.0391
0400 - 0500	0.0054	0.0095	0.0096	0.0051	0.0035	0.0018	0.0010	0.0004	0.0003	0.0004	0.0004	0.0003	0.0001	0.0001	0.0000	0.0001	0.0378	0.0368
0500 - 0600	0.0039	0.0098	0.0115	0.0059	0.0030	0.0017	0.0009	0.0004	0.0003	0.0004	0.0004	0.0002	0.0001	0.0001	0.0001	0.0001	0.0388	0.0384
0600 - 0700	0.0029	0.0080	0.0119	0.0062	0.0035	0.0020	0.0009	0.0006	0.0004	0.0005	0.0006	0.0003	0.0001	0.0001	0.0001	0.0001	0.0382	0.0377
0700 - 0800	0.0022	0.0086	0.0119	0.0058	0.0028	0.0014	0.0008	0.0004	0.0003	0.0005	0.0003	0.0002	0.0001	0.0001	0.0001	0.0001	0.0355	0.0346
0800 - 0900	0.0020	0.0076	0.0103	0.0058	0.0030	0.0016	0.0007	0.0003	0.0003	0.0004	0.0005	0.0002	0.0000	0.0001	0.0000	0.0000	0.0329	0.0324
0900 - 1000	0.0017	0.0073	0.0110	0.0058	0.0029	0.0016	0.0009	0.0004	0.0002	0.0006	0.0008	0.0002	0.0001	0.0001	0.0001	0.0000	0.0336	0.0340
1000 - 1100	0.0021	0.0080	0.0116	0.0069	0.0027	0.0016	0.0008	0.0003	0.0003	0.0006	0.0011	0.0003	0.0001	0.0002	0.0001	0.0000	0.0367	0.0374
1100 - 1200	0.0023	0.0085	0.0111	0.0064	0.0030	0.0017	0.0010	0.0007	0.0004	0.0008	0.0011	0.0005	0.0002	0.0003	0.0001	0.0001	0.0380	0.0380
1200 - 1300	0.0029	0.0102	0.0106	0.0060	0.0034	0.0020	0.0011	0.0006	0.0008	0.0010	0.0010	0.0003	0.0002	0.0001	0.0001	0.0001	0.0405	0.0397
1300 - 1400	0.0029	0.0100	0.0105	0.0059	0.0028	0.0020	0.0016	0.0007	0.0007	0.0012	0.0017	0.0004	0.0002	0.0002	0.0002	0.0001	0.0412	0.0408
1400 - 1500	0.0031	0.0111	0.0118	0.0059	0.0025	0.0017	0.0009	0.0006	0.0008	0.0008	0.0009	0.0005	0.0003	0.0002	0.0001	0.0002	0.0412	0.0404
1500 - 1600	0.0034	0.0129	0.0122	0.0051	0.0019	0.0011	0.0013	0.0006	0.0015	0.0011	0.0008	0.0002	0.0002	0.0004	0.0000	0.0001	0.0428	0.0421
1600 - 1700	0.0039	0.0120	0.0116	0.0051	0.0019	0.0011	0.0006	0.0003	0.0005	0.0006	0.0017	0.0004	0.0002	0.0004	0.0002	0.0003	0.0407	0.0413
1700 - 1800	0.0042	0.0151	0.0126	0.0049	0.0022	0.0010	0.0008	0.0004	0.0007	0.0013	0.0013	0.0006	0.0002	0.0005	0.0002	0.0001	0.0463	0.0452
1800 - 1900	0.0025	0.0119	0.0117	0.0054	0.0023	0.0010	0.0011	0.0005	0.0011	0.0009	0.0017	0.0006	0.0002	0.0002	0.0001	0.0002	0.0413	0.0392
1900 - 2000	0.0032	0.0126	0.0158	0.0057	0.0024	0.0014	0.0007	0.0006	0.0006	0.0008	0.0009	0.0003	0.0003	0.0003	0.0001	0.0001	0.0456	0.0417
2000 - 2100	0.0038	0.0137	0.0137	0.0054	0.0026	0.0012	0.0007	0.0005	0.0005	0.0009	0.0011	0.0002	0.0003	0.0002	0.0001	0.0001	0.0449	0.0440
2100 - 2200	0.0033	0.0136	0.0139	0.0055	0.0025	0.0012	0.0006	0.0004	0.0005	0.0009	0.0012	0.0003	0.0002	0.0002	0.0001	0.0001	0.0446	0.0439
2200 - 2300	0.0029	0.0123	0.0137	0.0061	0.0029	0.0015	0.0010	0.0005	0.0007	0.0010	0.0017	0.0003	0.0004	0.0003	0.0002	0.0001	0.0458	0.0467
2300 - 2400	0.0039	0.0146	0.0166	0.0080	0.0036	0.0018	0.0010	0.0004	0.0005	0.0010	0.0011	0.0003	0.0003	0.0010	0.0002	0.0001	0.0543	0.0533
Total	0.0901	0.2672	0.2896	0.1449	0.0706	0.0387	0.0226	0.0113	0.0129	0.0180	0.0251	0.0069	0.0043	0.0056	0.0024	0.0023	1.0151	1.0000
Adjusted	0.0897	0.2621	0.2840	0.1445	0.0700	0.0384	0.0226	0.0113	0.0131	0.0180	0.0243	0.0068	0.0044	0.0056	0.0027	0.0024	1.0000	

Appendix Table B.5. Left bank Anvik River summer chum salmon proportions by hour and sector, 2000.

	Sector																	Total
Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
0000 - 0100	0.0014	0.0083	0.0122	0.0079	0.0042	0.0032	0.0029	0.0022	0.0014	0.0014	0.0012	0.0006	0.0005	0.0004	0.0007	0.0027	0.0511	0.0519
0100 - 0200	0.0026	0.0116	0.0132	0.0074	0.0031	0.0024	0.0026	0.0017	0.0007	0.0008	0.0006	0.0003	0.0004	0.0006	0.0006	0.0006	0.0494	0.0488
0200 - 0300	0.0039	0.0208	0.0167	0.0088	0.0040	0.0028	0.0025	0.0013	0.0004	0.0008	0.0001	0.0002	0.0003	0.0002	0.0005	0.0006	0.0639	0.0632
0300 - 0400	0.0032	0.0151	0.0136	0.0082	0.0049	0.0033	0.0026	0.0017	0.0009	0.0007	0.0004	0.0005	0.0005	0.0005	0.0010	0.0010	0.0582	0.0565
0400 - 0500	0.0017	0.0083	0.0106	0.0069	0.0032	0.0022	0.0026	0.0018	0.0007	0.0011	0.0003	0.0003	0.0003	0.0006	0.0005	0.0006	0.0417	0.0416
0500 - 0600	0.0012	0.0036	0.0074	0.0048	0.0028	0.0024	0.0029	0.0026	0.0023	0.0016	0.0006	0.0005	0.0005	0.0004	0.0005	0.0008	0.0348	0.0347
0600 - 0700	0.0009	0.0026	0.0057	0.0040	0.0031	0.0026	0.0028	0.0028	0.0012	0.0020	0.0010	0.0013	0.0017	0.0008	0.0010	0.0017	0.0353	0.0351
0700 - 0800	0.0008	0.0041	0.0055	0.0040	0.0023	0.0016	0.0014	0.0014	0.0013	0.0011	0.0009	0.0017	0.0018	0.0008	0.0010	0.0024	0.0321	0.0314
0800 - 0900	0.0009	0.0030	0.0039	0.0033	0.0017	0.0018	0.0020	0.0013	0.0009	0.0017	0.0014	0.0014	0.0023	0.0013	0.0022	0.0024	0.0315	0.0311
0900 - 1000	0.0008	0.0027	0.0041	0.0022	0.0027	0.0026	0.0019	0.0012	0.0018	0.0019	0.0008	0.0016	0.0023	0.0015	0.0018	0.0042	0.0342	0.0334
1000 - 1100	0.0008	0.0033	0.0055	0.0035	0.0027	0.0020	0.0020	0.0017	0.0017	0.0013	0.0010	0.0010	0.0016	0.0020	0.0024	0.0030	0.0353	0.0350
1100 - 1200	0.0008	0.0028	0.0045	0.0041	0.0024	0.0025	0.0038	0.0026	0.0015	0.0017	0.0008	0.0013	0.0027	0.0016	0.0016	0.0020	0.0368	0.0348
1200 - 1300	0.0008	0.0027	0.0034	0.0029	0.0027	0.0028	0.0025	0.0026	0.0027	0.0015	0.0009	0.0019	0.0024	0.0018	0.0016	0.0016	0.0349	0.0337
1300 - 1400	0.0008	0.0043	0.0031	0.0031	0.0025	0.0029	0.0031	0.0027	0.0017	0.0018	0.0011	0.0007	0.0014	0.0018	0.0019	0.0024	0.0351	0.0344
1400 - 1500	0.0010	0.0039	0.0033	0.0031	0.0016	0.0014	0.0018	0.0020	0.0017	0.0021	0.0020	0.0013	0.0017	0.0018	0.0025	0.0023	0.0335	0.0326
1500 - 1600	0.0008	0.0039	0.0031	0.0022	0.0010	0.0015	0.0022	0.0015	0.0021	0.0018	0.0010	0.0015	0.0019	0.0020	0.0022	0.0027	0.0313	0.0296
1600 - 1700	0.0006	0.0041	0.0050	0.0043	0.0017	0.0019	0.0022	0.0028	0.0010	0.0023	0.0007	0.0013	0.0027	0.0026	0.0030	0.0033	0.0395	0.0383
1700 - 1800	0.0008	0.0038	0.0043	0.0027	0.0013	0.0015	0.0016	0.0019	0.0014	0.0019	0.0011	0.0018	0.0024	0.0027	0.0019	0.0024	0.0336	0.0331
1800 - 1900	0.0006	0.0038	0.0048	0.0039	0.0020	0.0020	0.0025	0.0023	0.0028	0.0022	0.0013	0.0014	0.0032	0.0030	0.0021	0.0027	0.0404	0.0394
1900 - 2000	0.0011	0.0048	0.0049	0.0044	0.0026	0.0030	0.0040	0.0039	0.0035	0.0025	0.0014	0.0013	0.0021	0.0017	0.0015	0.0028	0.0455	0.0439
2000 - 2100	0.0015	0.0063	0.0067	0.0044	0.0020	0.0027	0.0025	0.0027	0.0033	0.0019	0.0016	0.0021	0.0020	0.0010	0.0018	0.0030	0.0455	0.0453
2100 - 2200	0.0011	0.0071	0.0093	0.0050	0.0029	0.0027	0.0033	0.0027	0.0019	0.0021	0.0014	0.0017	0.0021	0.0018	0.0015	0.0024	0.0489	0.0486
2200 - 2300	0.0010	0.0097	0.0153	0.0078	0.0028	0.0026	0.0022	0.0020	0.0037	0.0032	0.0022	0.0027	0.0013	0.0014	0.0016	0.0036	0.0633	0.0632
2300 - 2400	0.0014	0.0080	0.0116	0.0082	0.0039	0.0026	0.0026	0.0036	0.0018	0.0017	0.0014	0.0016	0.0024	0.0013	0.0015	0.0074	0.0610	0.0604
Total	0.0305	0.1483	0.1778	0.1170	0.0643	0.0570	0.0604	0.0530	0.0425	0.0409	0.0255	0.0301	0.0406	0.0336	0.0367	0.0586	1.0168	1.0000
Adjusted	0.0298	0.1448	0.1762	0.1162	0.0642	0.0567	0.0588	0.0513	0.0414	0.0398	0.0247	0.0293	0.0394	0.0326	0.0363	0.0583	1.0000	

Appendix Table B.6. Right and left bank Anvik River summer chum salmon proportions by hour and sector, 2000.

	Sector																	Total
Hour	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total	Adjusted
0000 - 0100	0.0045	0.0128	0.0148	0.0082	0.0050	0.0027	0.0016	0.0008	0.0006	0.0010	0.0019	0.0003	0.0003	0.0003	0.0002	0.0005	0.0555	0.0551
0100 - 0200	0.0068	0.0132	0.0127	0.0075	0.0036	0.0022	0.0014	0.0007	0.0005	0.0006	0.0005	0.0002	0.0001	0.0003	0.0001	0.0001	0.0505	0.0502
0200 - 0300	0.0074	0.0137	0.0123	0.0067	0.0034	0.0019	0.0011	0.0006	0.0004	0.0006	0.0015	0.0001	0.0001	0.0001	0.0001	0.0001	0.0500	0.0496
0300 - 0400	0.0066	0.0109	0.0099	0.0061	0.0034	0.0020	0.0011	0.0005	0.0004	0.0004	0.0004	0.0001	0.0001	0.0001	0.0002	0.0002	0.0424	0.0416
0400 - 0500	0.0049	0.0094	0.0097	0.0053	0.0034	0.0018	0.0012	0.0006	0.0004	0.0005	0.0004	0.0003	0.0001	0.0001	0.0001	0.0001	0.0383	0.0375
0500 - 0600	0.0035	0.0089	0.0109	0.0058	0.0030	0.0018	0.0012	0.0007	0.0006	0.0006	0.0005	0.0002	0.0002	0.0002	0.0001	0.0002	0.0383	0.0379
0600 - 0700	0.0026	0.0072	0.0110	0.0059	0.0034	0.0021	0.0012	0.0009	0.0005	0.0008	0.0006	0.0004	0.0003	0.0002	0.0003	0.0004	0.0377	0.0373
0700 - 0800	0.0020	0.0080	0.0110	0.0055	0.0027	0.0014	0.0009	0.0005	0.0005	0.0006	0.0004	0.0004	0.0004	0.0002	0.0002	0.0004	0.0350	0.0341
0800 - 0900	0.0019	0.0069	0.0094	0.0054	0.0028	0.0017	0.0009	0.0005	0.0004	0.0006	0.0007	0.0003	0.0004	0.0003	0.0004	0.0004	0.0327	0.0322
0900 - 1000	0.0015	0.0066	0.0100	0.0053	0.0029	0.0017	0.0010	0.0005	0.0004	0.0008	0.0008	0.0004	0.0004	0.0003	0.0003	0.0006	0.0336	0.0339
1000 - 1100	0.0019	0.0073	0.0107	0.0064	0.0027	0.0016	0.0010	0.0005	0.0005	0.0007	0.0011	0.0004	0.0004	0.0004	0.0004	0.0005	0.0365	0.0370
1100 - 1200	0.0021	0.0076	0.0101	0.0061	0.0029	0.0018	0.0014	0.0009	0.0006	0.0009	0.0011	0.0006	0.0006	0.0005	0.0003	0.0004	0.0378	0.0376
1200 - 1300	0.0025	0.0091	0.0096	0.0056	0.0033	0.0021	0.0013	0.0009	0.0010	0.0011	0.0010	0.0005	0.0005	0.0004	0.0003	0.0003	0.0397	0.0388
1300 - 1400	0.0026	0.0092	0.0094	0.0055	0.0028	0.0021	0.0018	0.0010	0.0008	0.0013	0.0016	0.0004	0.0003	0.0005	0.0004	0.0004	0.0403	0.0399
1400 - 1500	0.0028	0.0100	0.0106	0.0055	0.0023	0.0016	0.0010	0.0008	0.0009	0.0010	0.0011	0.0006	0.0005	0.0004	0.0005	0.0005	0.0401	0.0393
1500 - 1600	0.0030	0.0116	0.0108	0.0047	0.0018	0.0011	0.0014	0.0007	0.0016	0.0012	0.0009	0.0004	0.0004	0.0007	0.0003	0.0005	0.0412	0.0403
1600 - 1700	0.0034	0.0108	0.0107	0.0050	0.0019	0.0012	0.0008	0.0007	0.0006	0.0008	0.0015	0.0005	0.0006	0.0007	0.0006	0.0007	0.0405	0.0409
1700 - 1800	0.0037	0.0135	0.0114	0.0046	0.0020	0.0011	0.0009	0.0007	0.0008	0.0014	0.0013	0.0008	0.0006	0.0008	0.0005	0.0004	0.0445	0.0434
1800 - 1900	0.0022	0.0108	0.0107	0.0052	0.0022	0.0011	0.0013	0.0008	0.0013	0.0011	0.0017	0.0007	0.0006	0.0006	0.0003	0.0005	0.0412	0.0392
1900 - 2000	0.0029	0.0115	0.0119	0.0055	0.0024	0.0016	0.0012	0.0011	0.0010	0.0010	0.0010	0.0004	0.0005	0.0005	0.0003	0.0005	0.0433	0.0420
2000 - 2100	0.0035	0.0126	0.0127	0.0053	0.0025	0.0014	0.0009	0.0008	0.0009	0.0010	0.0012	0.0005	0.0005	0.0003	0.0004	0.0005	0.0449	0.0442
2100 - 2200	0.0030	0.0127	0.0132	0.0055	0.0026	0.0014	0.0010	0.0008	0.0007	0.0010	0.0012	0.0005	0.0004	0.0005	0.0003	0.0004	0.0452	0.0446
2200 - 2300	0.0027	0.0119	0.0140	0.0063	0.0029	0.0017	0.0012	0.0007	0.0012	0.0013	0.0018	0.0006	0.0005	0.0005	0.0004	0.0006	0.0484	0.0491
2300 - 2400	0.0036	0.0137	0.0158	0.0080	0.0037	0.0019	0.0012	0.0009	0.0007	0.0011	0.0012	0.0005	0.0006	0.0010	0.0003	0.0012	0.0553	0.0543
Total	0.0815	0.2500	0.2734	0.1408	0.0697	0.0414	0.0280	0.0174	0.0172	0.0213	0.0251	0.0103	0.0096	0.0097	0.0074	0.0104	1.0130	1.0000
Adjusted	0.0810	0.2451	0.2684	0.1404	0.0692	0.0411	0.0279	0.0171	0.0172	0.0211	0.0244	0.0100	0.0095	0.0095	0.0075	0.0105	1.0000	

Appendix Table C.1 Anvik River summer chum salmon escapement age and sex composition by stratum, weighted season total, and mean length (mm), 2000. [a]

		Brood Year and Age Group				
		1997	1996	1995	1994	
		0.2	0.3	0.4	0.5	Total
Stratum:	6/21-7/08		Stratum 2			
Sample Size:	115					
Female	No. in Escapement	0	19,423	12,074	525	32,022
	Percent of Sample	0.0	32.2	20.0	0.9	53.0
Male	No. in Escapement	0	17,323	10,499	525	28,347
	Percent of Sample	0.0	28.7	17.4	0.9	47.0
Total	No. in Escapement	0	36,747	22,573	1,050	60,370
	Percent of Sample	0.0	60.9	37.4	1.7	100.0
Stratum:	7/09-7/18		Stratum 3			
Sample Size:	91					
Female	No. in Escapement	0	36,344	13,390	956	50,691
	Percent of Sample	0.0	41.8	15.4	1.1	58.2
Male	No. in Escapement	956	30,606	3,826	956	36,344
	Percent of Sample	1.1	35.2	4.4	1.1	41.8
			0			
Total	No. in Escapement	956	66,950	17,216	1,913	87,035
	Percent of Sample	1.1	76.9	19.8	2.2	100.0
Stratum:	7/19-7/28		Stratum 4			
Sample Size:	128					
Female	No. in Escapement	765	31,355	3,824	765	36,708
	Percent of Sample	1.6	64.1	7.8	1.6	75.0
Male	No. in Escapement	0	9,942	2,294	0	12,236
	Percent of Sample	0.0	20.3	4.7	0.0	25.0
Total	No. in Escapement	765	41,297	6,118	765	48,944
	Percent of Sample	1.6	84.4	12.5	1.6	100.0
Stratum:	6/21-7/28		Season Total			
Sample Size:	334					
Female	No. in Escapement	765	87,123	29,288	2,246	119,421
	Percent of Sample	0.4	44.4	14.9	1.1	60.8
Male	No. in Escapement	956	57,871	16,619	1,481	76,928
	Percent of Sample	0.5	29.5	8.5	0.8	39.2
Total	No. in Escapement	1,721	144,994	45,907	3,728	196,349
	Percent of Sample	0.9	73.8	23.4	1.9	100.0

[a] Not enough samples were collected for the first stratum (6/15-7/03) due to the late run and high water